Tampere University

LAURI VUORINEN

Managing Value Creation in Temporary Organizations

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ACADEMIC DISSERTATION
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ACADEMIC DISSERTATION
Tampere University, Faculty of Engineering and Natural Sciences
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Vaarille (1938-2018), joka sytytti intohimoni tieteeseen, tietoon ja viisauteen.

PREFACE

As with every project, also my dissertation project had a start and an end. Officially, this project started in autumn 2014. Personally, I do however feel that it begun a lot earlier, maybe already in autumn 2008, when I first sat down at the auditorium of the Tampere University of Technology (the current Tampere University). Since that day, all the experiences and lessons learned, and — most importantly — the numerous amazing people I have met along the way, have shaped me in various ways. Shaped me both as a young scientist, but also as a person. Thus, the end of the dissertation project is not only a milestone of my career, but also an important step in personal growth. I would not have been able to achieve either of these alone.

This dissertation would have never seen the light of the day without my supervisor Professor Miia Martinsuo. It was Miia who introduced me to the research field of project management in the first place, and gave me the chance to practice and test my skills first as a Master's Thesis Worker, and later as a Doctoral Researcher. Miia, I am grateful for your expertise, support and insight throughout this whole journey. Thank you especially for setting the standards high, for being demanding in a positive way, and for introducing me to the international communities of our research field from the very beginning.

I was honored to have two experienced scientists act as the pre-examiners to my dissertation. Assistant Professor Kirsi Aaltonen (University of Oulu, Finland) and Associate Professor Per Svejvig (Aarhus University, Denmark) invested their valuable time into evaluating my work, and provided me with some very insightful comments. Their feedback improved this dissertation significantly. This being an article-based dissertation, I am also grateful to the anonymous reviewers of my journal articles, and to the editors of the journals that published my research.

I wish to thank all the funders who have supported my research during the last few years. The S4Fleet (Service Solutions for Fleet Management) research program was coordinated by DIMECC (Digital, Internet, Materials & Engineering Co-Creation) and funded by Business Finland, research institutes, and the participating companies. The following parties supported my dissertation project with research grants: the Finnish Foundation for Technology Promotion, the Foundation for

Economic Education, the Marcus Wallenberg Foundation, the Paulo Foundation, and the Yrjö and Senja Koivunen Foundation.

Regarding internationalization, I had the privilege to spend a few months at the University of Technology Sydney (UTS) in 2017. I still consider these inspiring and productive months as a key moment in setting a new pace for the latter part of my dissertation project. I want to express my gratitude to my host at UTS, Associate Professor Catherine Killen. Thank you Cathy for the inspiration and for your hospitality! Let us continue our fruitful collaboration also in the future.

I have been extremely lucky to share these years with some amazing colleagues. My foremost gratitude goes to Johanna, with whom we have shared countless common moments over the last decade or so. Whether it has been the ups and downs of the dissertation project, or the joys and sorrows of life, you have always been available. Johanna, I feel honored to call you not only a perfect colleague, but also a dear, lifelong friend. Thank you also to all the former and current members of the CROPS research team, especially Beheshte, Eija, Jesse, Matias, Rami, Sanna, Santtu, Toni, and Tuomas. It has been a pleasure to work with you and to enjoy some nice time outside the office as well. The same applies to many other great colleagues at the university, especially Markus, Milla, and Natalia. Thank you!

Working on a long project such as a dissertation can be a bit exhausting at times. Luckily, I have numerous great friends, who have not only been interested in my research, but have also helped me to get my mind out of the work zone. There has been no shortage of laughter and joy in my life thanks to you all. I am also blessed to have a supportive family. From the very early moments of my childhood, you have encouraged and supported me in countless ways. The same applies to this dissertation project. Even if you might not have always understood all the aspects of scientific work, you have stayed interested, positive and encouraging. Thank you very much for that.

Finally, I wish to express my deepest gratitude and love to my wife Vilma. Whether it has been the delight of an accepted journal article, the stress of overwhelming commitments, or the anxiety of searching for the direction for my dissertation or my career, you have always been there to encourage and support me. Even more importantly, we have experienced so many amazing moments together in the last six years. I feel so grateful to share my life with you.

In Tammisto, Vantaa on the 9th of October 2019

Lauri Vuorinen

ABSTRACT

In recent decades, projects and project-based organizing have spread to all kinds of organizations. Consequently, the research field of project management has progressed and evolved as well. Earlier research conceptualized projects as tools or production functions that seek to fulfill predefined, specific objectives. This research builds on two recent developments that challenge this rationalistic viewpoint: the viewpoints of temporary organizing and value creation.

Temporary organizations are sets of organizational actors working together on a complex task over a limited period of time. Conceptualizing projects as temporary organizations, the viewpoint of temporary organizing emphasizes the social, behavioral, and organizational aspects of project management. The perspective of value creation builds on the nature of project goals and project success. This viewpoint describes how benefits and costs (i.e., value) occur throughout the project lifecycle — from the early front-end phase to the operations phase — and how the evaluation of project success should not be limited to project completion.

Despite the growing interest in value creation, there is a lack of understanding of management strategies for value creation. In comparison to the predefined objectives of the rationalistic viewpoint, value is subjective, multidimensional, and uncertain. That is why this dissertation raises the following question: how is value creation managed in temporary organizations? This study examines three ways of managing value creation: through organizational control, the management of organizational interdependencies (coordination and integration), and by considering the stakeholder viewpoint.

In addition to this introduction, this article-based dissertation is comprised of five journal articles. A sequential research design taking qualitative research approaches was followed. Depending on the study, the primary research data were interviews or newspaper articles. This dissertation studied four types of temporary organizations: infrastructure projects, maintenance projects, organizational change programs, and system delivery projects.

The findings of this dissertation illustrate organizational control targeting value-oriented goals, coordination and integration as ways of managing value creation at organizational interfaces and show that stakeholders' perceptions of value drive their

efforts to influence temporary organizations. To encourage desirable actions, internal and external actors design different control packages for different dimensions of value. In a similar vein, external stakeholders use different influence strategies to exert influence on temporary organizations. Influence efforts taken by the stakeholders are driven by their perceptions of value. Due to the division of work and the embeddedness of the temporary organization in external contexts, there are interdependencies within and around temporary organizations. Coordination and integration are the procedures used for managing organizational interdependencies, and by managing those interdependencies, value creation is promoted.

This research makes three contributions to the earlier literature. First, it proposes that value-oriented goals are a source of task complexity in temporary organizations. Value orientation consists of three characteristics of value: lifecycle orientation, subjectivity, and multidimensionality. This way, value orientation provides a new viewpoint on the nature of the tasks performed by temporary organizations. Second, acknowledging value orientation as a source of task complexity, this dissertation proposes a framework for managing value creation in temporary organizations. The three elements of the framework — organizational control, management of organizational interdependencies, and the stakeholder viewpoint — are not interchangeable, but they complement each other by focusing on different aspects of value creation. Finally, this research demonstrates the multi-level nature of value creation. Value creation takes place and has to be managed at three different organizational levels: within the temporary organization, between the temporary and the permanent organization, and between the temporary organization and the external environment.

TIIVISTELMÄ

Projektit ja projektinhallinta ovat levinneet kaiken tyyppisiin organisaatioihin toimialasta riippumatta. Aikaisempi projektinhallinnan tutkimus tarkasteli projekteja työkaluina tai tuotantofunktioina, joiden tavoitteena oli täyttää ennalta määriteltyjä tavoitteita. Tämä väitöskirjatutkimus pohjautuu kahteen tuoreempaan kehityssuuntaan, jotka haastavat aiemman tutkimuksen rationaalisen lähestymistavan. Nämä kehityssuunnat ovat väliaikainen organisointi (engl. *temporary organizing*) ja arvontuotto (engl. *value creation*).

Väliaikainen organisaatio määritellään joukoksi organisatorisia toimijoita, jotka työskentelevät rajoitetun ajan monimutkaisen tehtävän parissa. Väliaikaisen organisoinnin näkökulma korostaa projektinhallinnan sosiaalisia, käyttäytymistieteellisiä ja organisatorisia ulottuvuuksia, jotka ovat saaneet vähemmän huomiota aiemmassa kirjallisuudessa. Arvontuoton näkökulma vuorostaan pohjautuu projektin tavoitteiden ja projektin onnistumisen luonteeseen. Arvontuoton näkökulma kuvaa, kuinka arvoa syntyy läpi projektin elinkaaren, eli projektin alkuvaiheista projektin käyttövaiheeseen asti. Projektin onnistumisen arviointi ei myöskään saisi rajoittua projektin toteutusvaiheen päättymiseen.

Arvontuotto on herättänyt kasvavaa tutkimuksellista kiinnostusta, mutta ymmärrys arvontuoton johtamisesta on edelleen puutteellista. Vertailtaessa arvontuottoa rationaalisen näkökulman ennalta määriteltyihin tavoitteisiin arvo on subjektiivista, moniulotteista ja epävarmaa. Tästä erosta johtuen tämä väitöskirja esittää seuraavan kysymyksen: miten arvontuottoa johdetaan väliaikaisissa organisaatioissa? Tämä tutkimus tarkastelee kolmea tapaa arvontuoton johtamiseen: ohjausta (engl., *control*), organisatoristen riippuvuussuhteiden hallintaa (koordinaatio ja integraatio), sekä sidosryhmänäkökulmaa.

Väitöskirja muodostuu viidestä lehtijulkaisusta sekä tästä johdannosta. Tutkimus toteutettiin peräkkäistutkimuksina laadullisilla tutkimusotteilla. Ensisijainen tutkimusaineisto koostui haastatteluista ja sanomalehtiartikkeleista. Väitöskirjatutkimus tarkasteli neljäntyyppisiä väliaikaisia organisaatioita: huolto-, järjestelmätoimitus- ja infrastruktuuriprojekteja sekä organisatorisia muutosohjelmia.

Tutkimuksen tulosten mukaan ohjausta kohdistetaan arvontuoton tavoitteille, koordinaatio ja integraatio ovat keinoja hallita arvontuottoa organisatorisilla

rajapinnoilla ja sidosryhmien arvokäsitykset ohjaavat sidosryhmien pyrkimyksiä vaikuttaa väliaikaisiin organisaatioihin. Edistääkseen haluamiaan toimintatapoja organisaation sisäiset ja ulkoiset toimijat käyttävät erilaisia ohjausmenetelmiä kohdistettuina eri arvon ulottuvuuksille. Samaan tapaan ulkoiset sidosryhmät hyödyntävät erilaisia vaikutusstrategioita pyrkiessään vaikuttamaan väliaikaisiin organisaatioihin. Sidosryhmien arvokäsitykset ohjaavat näitä vaikuttamispyrkimyksiä. Väliaikaiset organisaatiot ovat uponneina (engl. *embedded*) ympäristöönsä. Tästä uponneisuudesta sekä organisatorisesta työnjaosta johtuen väliaikaisten organisaatioiden sisällä ja ympärillä on riippuvuussuhteita. Koordinaatio ja integraatio ovat keinoja hallita organisatorisia riippuvuussuhteita ja siten edistää arvontuottoa organisatorisilla rajapinnoilla.

Tämä väitöskirjatutkimus tuottaa kolme kontribuutiota aiempaan kirjallisuuteen. Ensinnäkin tämä tutkimus esittää pyrkimyksen arvontuottoon yhtenä tehtävien monimutkaisuuden lähteenä. Pyrkimys arvontuottoon pohjautuu arvon kolmeen ominaisuuteen: elinkaariajatteluun, subjektiivisuuteen ja moniulotteisuuteen. Tällä tavoin tämä tutkimus tarjoaa uuden näkökulman väliaikaisten organisaatioiden toteuttamien tehtävien luonteeseen. Toiseksi, arvontuoton monimutkaisuuteen pohjautuen, tämä tutkimus esittää arvontuoton johtamisen viitekehyksen väliaikaisissa organisaatioissa. Viitekehyksen kolme elementtiä, ohjaus, organisatoristen riippuvuussuhteiden hallinta ja sidosryhmänäkökulma, eivät ole vaihdannaisia, vaan ne täydentävät toisiaan keskittymällä arvontuoton eri osa-alueisiin. Lopuksi tämä tutkimus havainnollistaa arvontuoton monitasoista luonnetta. Arvontuottoa tapahtuu ja sitä täytyy johtaa kolmella organisatorisella tasolla: väliaikaisen organisaation sisällä, väliaikaisen ja pysyvän organisaation välillä sekä väliaikaisen organisaation ja ulkoisen ympäristön välillä.

CONTENTS

ORIGINAL PUBLICATIONS

Publication I Kivilä, J., Martinsuo, M., & Vuorinen, L. (2017). Sustainable project management through project control in infrastructure projects. *International Journal of Project Management*, 35(6), 1167–1183.

Publication II Vuorinen, L., & Martinsuo, M. (2018). Program integration in multi-project change programs: Agency in integration practice. *International Journal of Project Management*, 36(4), 583–599.

Publication III Vuorinen, L., & Martinsuo, M. (2019). Lifecycle view of managing different changes in projects. *International Journal of Managing Projects in Business,* 12(1), 120–143.

Publication IV Vuorinen, L., & Martinsuo, M. (2019). Value-oriented stakeholder influence on infrastructure projects. *International Journal of Project Management*, 37(5), 750–766.

Publication V Vuorinen, L., & Martinsuo, M. (2019). Promoting project team coordination in repetitive projects. *The Journal of Modern Project Management*, 7(1), 162-177.

AUTHOR'S CONTRIBUTION TO THE CO-AUTHORED PUBLICATIONS

In preparation for Article I, I reviewed the literature and wrote the sections on project control. I analyzed the data from a control perspective and wrote the respective sections in the findings. The discussion and the contributions were developed by the three authors together. After the first round of review feedback, I took a major role in writing the revised version of the manuscript. Based on the feedback from the journal's anonymous reviewers and the guest editors of the special issue, my co-authors and I collaboratively developed the final version of the article. The authors' names are listed in alphabetical order, but all the authors contributed equally to writing the article.

Together, Miia Martinsuo and I developed the idea for the research presented in Article II. I reviewed the literature and wrote the sections on program management and integration. I collected the interview data and analyzed the data using a jointly

developed analysis framework. The discussion section was developed together by us. We revised the article based on the feedback we received from the anonymous reviewers of the journal.

In the preparation of Article III, I was responsible for designing the empirical study, collecting the interview data, and conducting the data analysis. The literature was reviewed by Miia Martinsuo and I. I was the main person responsible for the sections on improvisation in projects. I wrote the discussion section with guidance from Miia Martinsuo. I presented a preliminary version of this article at the Project Organizing SIG of the 2017 European Academy of Management (EURAM) conference. Based on the feedback we received from the conference reviewers and participants, a fully developed version was submitted to a journal for publication. Based on the feedback given by the anonymous reviewers of the journal, Miia Martinsuo and I prepared a revised version of the article.

For Article IV, I set out the research idea and the goals of the study. I collected a small amount of newspaper data and conducted the data analysis. The majority of the newspaper data were collected by our research groups' research assistants. I reviewed the literature and was particularly responsible for writing the sections on public values and stakeholder influence strategies. I wrote the discussion section with the guidance of Miia Martinsuo. Based on the feedback we received from the anonymous reviewers of the journal and the guest editor of the special issue, we prepared a revised version of the article.

I defined the research idea and the goals of the study presented in Article V. I collected the interview data and conducted the data analysis. I reviewed the literature and was especially responsible for writing the section on project team coordination. I wrote the discussion section with the guidance of Miia Martinsuo. An earlier version of the article was presented at the Project Organizing stream of the 2017 Australian and New Zealand Academy of Management (ANZAM) conference. The manuscript submitted to the journal was radically developed, based on the feedback received from the conference reviewers and participants.

1 INTRODUCTION

1.1 Background

1.1.1 Projects and programs as temporary organizations

Projects have shaped societies and the world for centuries and continue to do so today (PMI, 2017). Monuments (such as pyramids) and famous buildings (such as the Sydney Opera House) are examples of challenging construction projects. The Apollo program included several complex research and development projects in pursuit of its goal to land the first humans on the Moon. Large-scale events such as the Olympic Games are organized and managed as projects. Numerous studies have emphasized how project-based organizing has spread to different industries and all kinds of organizations (e.g., Midler, 1995; Schoper et al., 2018; Whittington et al., 1999).

The early decades of project management research, beginning in around the 1950s (Levene, 1996; Packendorff, 1995), were characterized by a planning-centric focus on single projects (Packendorff, 1995; Söderlund, 2004; Svejvig and Andersen, 2015). This rationalistic viewpoint on project management considered projects as tools (Packendorff, 1995) or production functions (Turner and Müller, 2003) and focused little on issues such as the background and context of projects, or the motives of the individuals participating in them (Packendorff, 1995). Since the mid-1990s, the conceptualization of projects as temporary organizations (Lundin and Söderholm, 1995; Packendorff, 1995) has challenged this rationalistic viewpoint, especially by directing attention to the behavioral and organizational dimensions of projects and project management (Söderlund, 2004). This dissertation takes a temporary organizing view of projects and project management.

Temporary organizations can be defined as "a set of organizational actors working together on a complex task over a limited period of time" (Bakker, 2010, p. 468). There are various forms of temporary organizations (Bakker, 2010), but the focus of this dissertation is limited to projects and programs. Programs are

collections of projects, defined as "related projects, subsidiary programs, and program activities managed in a coordinated manner to obtain benefits not available from managing them individually" (PMI, 2017, p. 543).

The viewpoint of temporary organizing shifts the focus away from planning and structure to people, organizing, and the actions of individuals (Packendorff, 1995). This perspective sees projects as agencies established by a parent organization (Turner and Müller, 2003) and emphasizes the embeddedness of temporary organizations in their environment (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003). The concepts of a parent organization and embeddedness relate to the question of what is temporary versus what is permanent. As the name suggests, temporary organizations are finite; in other words, they have an anticipated end date or a deadline (e.g., Bakker, 2010). Temporary organizations are set up by permanent organizations (e.g., a firm). In project management, permanent organizations are often called parent organizations.

The embeddedness of a temporary organization calls for a strong recognition of the organizational and social context (Bakker, 2010) and for an understanding of the interactions between a temporary organization and its environment (Sydow et al., 2004). Consequently, this viewpoint necessitates broadening the research focus from the internal dynamics of a temporary organization to include the parent organization and the wider environment as well. This dissertation acknowledges both internal and external viewpoints to managing a temporary organization. The term "actor" is used with respect to individual and organizational actors both inside (internal to) and outside (external to) a temporary organization. External actors include both the permanent organization and the wider environment (stakeholders).

1.1.2 Temporary organizations and the delivery of value

Temporary organizations are task-oriented and temporally limited endeavors (Bakker, 2010). As Lundin and Söderholm (1995, p. 441) explain: "the creation of a temporary organization is motivated by the task that must be accomplished." In other words, a key area of temporary organizing is the task to be fulfilled by the temporary organization.

In the earlier literature, the task orientation of the temporary organization, especially a single project, was mostly limited to relatively predefined objectives (Svejvig and Andersen, 2015), illustrating a "temporary production" viewpoint (Winter and Szczepanek, 2008). The fulfilment of these objectives was often

measured using the "time–cost–scope/quality" iron triangle (Atkinson, 1999). However, at least since the late 1990s, scholars have been inclined to agree that a broader range of measures for project success are required (Atkinson, 1999; Shenhar et al., 2001, 1997). Exemplifying the inadequacy of the iron triangle and the need for broader success criteria, a project can fulfill the iron triangle criteria and still turn out to be unbeneficial or unnecessary (e.g., an unnecessary motorway or airport), and vice versa (e.g., the Sydney Opera House) (Lim and Mohamed, 1999).

In this study, temporary organizations are studied as vehicles for defining, creating, and delivering value (Laursen and Svejvig, 2016; Martinsuo et al., 2019a, 2017; Winter and Szczepanek, 2008). The core idea of value creation in temporary organizations is that there are benefits and costs occurring throughout the project lifecycle, from the project front end to the whole operation phase of the project deliverables (Artto et al., 2016). In other words, value is also created after the delivery of the project deliverables and project success cannot only be evaluated at the time of project completion (Martinsuo et al., 2019a; Winter and Szczepanek, 2008). Thus, the value creation viewpoint necessitates the consideration of the whole project lifecycle and expands the scope of the focus on the evaluation of project completion to include the benefits or consequences for a wider range of stakeholders over a longer timeframe as well (Artto et al., 2016; Laursen and Svejvig, 2016; Martinsuo et al., 2019a; Winter and Szczepanek, 2008). The growing interest in value creation in temporary organizations is reflected in the increasing number of publications (Laursen and Svejvig, 2016) on the subject and a recent special issue in the *International Journal of Project Management* (Martinsuo et al., 2019a), for example.

To clarify, in this study, value is analyzed from the perspective of the "worth" of the temporary organization and its results, rather than according to ideals and beliefs about what is good and right (Martinsuo et al., 2019a). Similarly, the term "value-oriented goals" is used with respect to the viewpoint of value creation.

1.1.3 Managing value creation in a temporary organization

Among the key questions for value creation is the management of value over the lifecycle of a temporary organization (Martinsuo et al., 2017). Regarding classic project management, the Project Management Institute (PMI) defines project management as "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (PMI, 2017, p. 10). In this dissertation,

the goals of project management (i.e., the "project requirements") are analyzed from the perspective of value creation.

In comparison to classic project management (PMI, 2017), or to the rationalistic tool (Packendorff, 1995) and production function perspectives (Turner and Müller, 2003), three key characteristics of value make managing value creation in temporary organizations more demanding: (1) the lifecycle orientation, (2) the subjectivity, and (3) the multidimensionality of value. Lifecycle orientation broadens the focus from the early front-end phase to the use phase (e.g., Artto et al., 2016) and creates a more challenging timeframe for managing a temporary organization. This characteristic of value raises questions such as "how is the use phase of the project deliverables addressed in the front-end or execution phases?" The subjective and multidimensional nature of value (e.g., Ahola et al., 2008; Ang et al., 2016; Green and Sergeeva, 2019; Martinsuo et al., 2019b; Martinsuo and Killen, 2014) emphasizes how value can be perceived differently and how value consists of various interrelated elements (e.g., financial value and sustainability). The divergent or even conflicting perceptions of value (e.g., van Marrewijk et al., 2016) raise questions such as "for whom is a temporary organization managed?"

To address the question of managing a temporary organization, advice from the general management literature can be utilized. Henri Fayol, one of the first and most cited management scholars, divided management in permanent organizations into five elements: planning, organizing, coordinating, commanding, and controlling (Fayol, 1949). Of the five elements proposed by Fayol, this dissertation focuses on coordinating and controlling. Commanding is excluded because it is more related to the leadership than the management of an organization. Planning and organizing are excluded because they mostly relate to the early front-end phase[1], while the focus of this dissertation is mostly on the execution phase. The relevance of the front-end and operations phases (e.g., Artto et al., 2016) is acknowledged, but it is argued that management becomes a focal question in the execution phase especially. That is why the focus of this dissertation is mostly limited to the execution phase.

Control and coordination are mostly internal management tasks. However, due to the subjective and multidimensional nature of value in particular, this dissertation acknowledges the external viewpoint of managing a temporary organization as well. The same issue is highlighted by the embeddedness of temporary organizations (Bakker, 2010; Sydow et al., 2004) in their environments. In this dissertation, the

[1] It is acknowledged that planning and organizing continue also in the project execution phase (e.g., PMI, 2017). However, in this dissertation it is argued that planning and organizing are tasks that take place *mostly* in the project front end.

external viewpoint of managing a temporary organization is addressed from the perspective of stakeholder theory (Freeman, 1984).

The three theoretical perspectives — control, coordination, and the stakeholder viewpoint — on managing value creation in temporary organizations are illustrated in Figure 1. The positioning of the three rectangles emphasizes the embedded nature of a temporary organization. The arrows and the positioning of the theoretical perspectives highlight how control and coordination focus mostly on the internal activities of a temporary organization, or the interface between a temporary and a permanent organization. The stakeholder viewpoint, on the other hand, directs attention to the external environment. All three perspectives are ultimately focused on value creation; by encouraging desirable action (control), by managing interrelated activities (coordination), and by acknowledging the interests of external stakeholders (the stakeholder viewpoint).

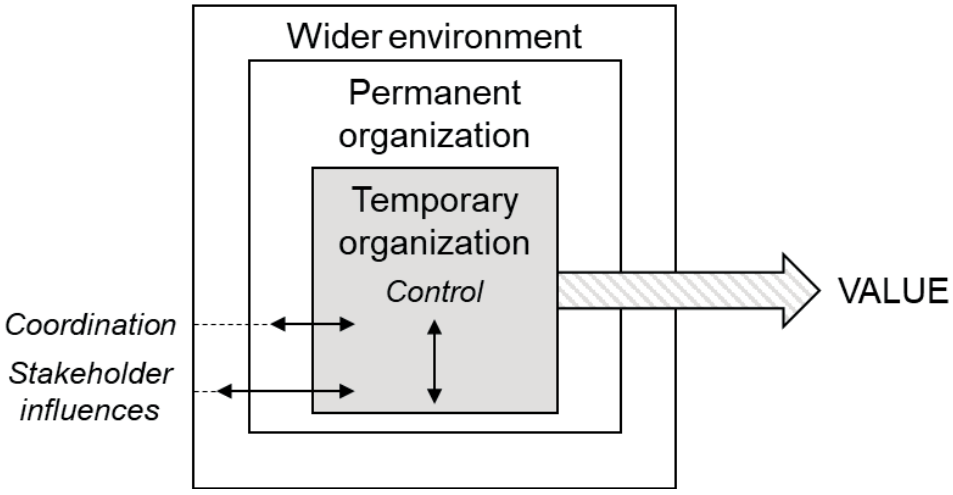

Figure 1. The theoretical viewpoints of this dissertation and the temporary organization embedded in its environment.

1.1.4 Research rationale

According to Fayol (1949), control refers to "seeing everything occurs in conformity with established rule and expressed command" (cited in Lamond, 2003, p. 7). With strong roots in management and management accounting, control theory (which is often labelled as organizational or managerial control) originates in permanent organizations (e.g., Ouchi, 1979).

Within the last few decades, control theory has been applied to different types of temporary organizations such as information system projects (e.g., Kirsch, 1997), construction projects (e.g., Tuuli et al., 2010), and engineering delivery projects (e.g., Liu et al., 2014). These studies have demonstrated that many of the findings from permanent organizations (e.g., different control configurations) also apply to temporary organizations. However, the viewpoint of value creation, especially the subjective and multidimensional nature of value, justifies the need for additional research. The subjectivity of value raises the question of whether all actors perceive desirable action similarly. The multidimensional nature of value, on the other hand, suggests that different controls could be required for different dimensions of value (e.g., financial value vs. sustainability). These two viewpoints raise a novel question regarding the relationship between control and value creation in a temporary organization. In particular, there is a need to understand better how control can encourage desirable action in a situation where organizational goals are multidimensional and subjective.

Another need for management arises from the division of work in organizations. This division of work between organizational subsystems creates the need for coordination (e.g., Van de Ven et al., 1976) or integration (e.g., Lawrence and Lorsch, 1967). As in permanent organizations, similar challenges related to the division of work and organizational interdependencies are evident in temporary organizations as well. Examples include project teams, multi-project programs, and the tasks or subprojects of projects. In addition, there are divisions of work between the permanent and the temporary organization (i.e., embeddedness of the temporary organization) (Bakker, 2010; Sydow et al., 2004).

Although several studies have covered coordination or integration in temporary organizations, especially in single projects or project teams (e.g., Hoegl et al., 2004), and to a lesser extent in multi-project programs (e.g., Turkulainen et al., 2015), calls for additional research on coordination in temporary organizations have been made (Bechky, 2006; Faraj and Xiao, 2006). Regarding value creation, the key question is similar to that which is posed in the case of control: how does the subjective and multidimensional nature of organizational goals manifest in the practice of coordination and integration? In addition, the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003) and the interface between the temporary and permanent organizations (e.g., Turkulainen et al., 2015) emphasize the interplay between the temporary and permanent organizations; in terms of value creation, the permanent organization is a key beneficiary of the temporary organization.

Control and the management of interdependencies (coordination and integration) focus mostly on the internal management of a temporary organization. However, temporary organizations are embedded in their wider environments as well (Figure 1) (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003), and the viewpoint of value creation emphasizes the creation of value for a wide range of stakeholders (Martinsuo et al., 2017). These two viewpoints necessitate an external viewpoint to the management of a temporary organization. In this dissertation, the external viewpoint is stakeholder theory.

Building on the seminal work on stakeholder theory in permanent organizations (e.g., Freeman, 1984), there is a strong stream of more recent literature on stakeholders in temporary organizations as well (Littau et al., 2010). Despite ongoing research on stakeholders in temporary organizations (Littau et al., 2010; Mok et al., 2015), the value-oriented viewpoint reveals two research gaps that necessitate further research.

First, the prior research has tended to focus more on the viewpoint of the focal firm or the project than the viewpoint of the stakeholders themselves (Aaltonen and Kujala, 2010; Laplume et al., 2008; Mok et al., 2015). However, different stakeholders perceive value in various ways (i.e., the subjectivity of value). Thus, the viewpoint of external stakeholders becomes highly relevant as well.

Second, stakeholders' different perceptions of value can drive their actions in different ways. Even if several studies have focused on topics such as stakeholder influence strategies in general (e.g., Aaltonen et al., 2008; Aaltonen and Kujala, 2010), less is known about the antecedents of stakeholder influences. In this dissertation, it is proposed that stakeholders' perceptions of value can explain their efforts to influence temporary organizations. This kind of knowledge is vital to understanding better the nature of stakeholder behavior in temporary organizations.

1.2 Research goals and research questions

The goal of this dissertation is to create understanding of the management of value creation in temporary organizations. This research offers solutions for project management frameworks to account for the lifecycle orientation of value creation and the subjective and multidimensional nature of value.

This dissertation takes the viewpoints of temporary organizing (Bakker, 2010; Lundin and Söderholm, 1995; Packendorff, 1995; Turner and Müller, 2003), value creation in temporary organizations (Laursen and Svejvig, 2016; Martinsuo et al.,

2019a, 2017; Winter and Szczepanek, 2008), and the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003). This study builds on three established streams of organization theory: control, coordination and integration (the management of organizational interdependencies), and the stakeholder view. The theoretical setting of this dissertation is illustrated in Figure 2.

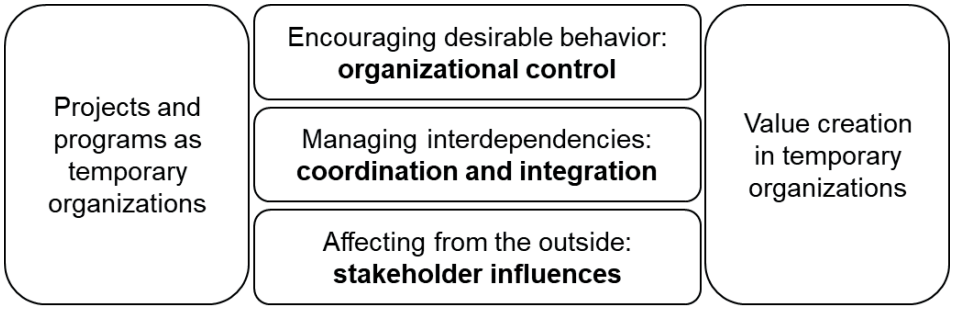

Figure 2. The theoretical setting of the dissertation.

The following three research questions are posed with regard to temporary organizations with value-oriented goals (i.e., regarding value creation in temporary organizations):

1. How do actors use control to encourage desirable actions?
2. How do actors manage interdependencies a) within the temporary organization; and b) between the temporary organization and the permanent organization?
3. How do stakeholders' perceptions of value drive their influence efforts?

The empirical focus is limited to projects and programs in B2B (business-to-business) contexts. The goals of the temporary organizations are addressed from the viewpoint of value creation, acknowledging the whole lifecycle from the front-end phase to the operations phase. However, most of the empirical focus is on the execution phase.

1.3 Research process and dissertation structure

The doctoral research was conducted as a compilation thesis. The dissertation includes five journal articles and this introduction. Table 1 summarizes the

relationships between the articles and the dissertation's research questions. The original articles are available as appendices to the printed version of the dissertation.

Table 1. Articles and their contributions to answering the research questions.

Research questions	Article I	Article II	Article III	Article IV	Article V
RQ 1: Control and value-oriented goals	X		X	/	
RQ 2: Management of interdependencies and value		X			X
RQ 3: Value perceptions and stakeholder influences	/			X	
X = significant contribution; / = moderate contribution.					

The empirical data were collected and the original publications were written in several phases. The articles and the overall research process are briefly discussed in the following.

Article I discusses control targeting multidimensional value-oriented goals in an infrastructure project and reveals the internal and external origins of control. The article contributes to answering the research questions by demonstrating how control is targeted at different dimensions of value (the three dimensions of sustainability).

Article II focuses on the management of interdependencies in multi-project change programs. The article studies integration from the perspective of agency, emphasizing the actions of project and program actors in pursuing integration. This complements the dominant focus on integration mechanisms demonstrated in the earlier literature.

From 2015 to 2018, I worked for the Service Solutions for Fleet Management (S4Fleet) research program, funded by Business Finland and the participating companies and research institutes and coordinated by DIMECC (a Finnish consortium for Digital, Internet, Material & Engineering Co-Creation). I collected the interview data for Articles III and V while working for this research program.

Article III focuses on change management and improvisation in engineering delivery projects. In terms of achieving the goals of this dissertation, this article is especially related to the viewpoint of control. The article acknowledges both internal and external actors and discusses their change management and improvisational actions when responding to different changes. Thus, Article III discusses the different ways in which project actors respond when a project is not progressing as planned.

Article IV emphasizes the external viewpoint of temporary organizing and discusses how stakeholders' influence efforts are driven by their perceptions of value. The main contribution of this article is the more nuanced understanding of the "whys" of stakeholder influence efforts that it offers.

Article V focuses on coordination and the management of interdependencies in repetitive projects. The article studies coordination in a specific context in which a formal management framework was introduced to standardize approaches to working in maintenance projects. The article contributes to answering the research questions by highlighting how implementing a project management methodology can promote project team coordination.

This chapter has introduced the background and set the goals of the dissertation. The next chapter describes the theoretical background of the dissertation in terms of value in temporary organizations, control, coordination and integration, and stakeholder influences. In the third chapter, the dissertation's methodological setting — including the research design, data collection, and data analysis — is described. The fourth chapter summarizes the key findings of the original publications, and the fifth chapter discusses the contributions of the dissertation as a whole in light of the earlier literature. The sixth chapter concludes the dissertation by summarizing its scientific contributions and the managerial implications of the study and by analyzing the validity and reliability of the findings.

2 THEORETICAL BACKGROUND

2.1 Temporary organizations and the delivery of value

Temporary organizations are task-oriented endeavors (Bakker, 2010; Lundin and Söderholm, 1995) and the fulfillment of that task is at the heart of project management research. Traditionally, temporary organizations — especially projects — have been focused on delivering a product with predefined objectives (Svejvig and Andersen, 2015), which is often measured by the iron triangle (Atkinson, 1999; Winter and Szczepanek, 2008).

In the 21st century, there has been a shift of focus away from "product delivery" to "value creation" (Winter and Szczepanek, 2008). This can be illustrated by calls for better measures of project success (Shenhar et al., 2001) and more recently by considering projects as means of creating value for stakeholders (Laursen and Svejvig, 2016; Svejvig and Andersen, 2015). The growing interest in the delivery of value by temporary organizations is demonstrated by the growing number of publications (Laursen and Svejvig, 2016) on the subject and a recent special issue in the *International Journal of Project Management* (Martinsuo et al., 2019a), for example. This chapter describes temporary organizations as vehicles for value creation.

2.1.1 Key concepts

In a recent literature review on value creation in projects, Laursen and Svejvig (2016) point out the inconsistent use of concepts and terms in the literature. Terms such as value, benefits, worth, and success have been used more or less interchangeably when referring to very similar concepts (Laursen and Svejvig, 2016). The same applies to concepts such as value creation, benefits management, and benefits realization management (Laursen and Svejvig, 2016). With a few exceptions (e.g., Ang et al., 2016; Martinsuo and Killen, 2014), most of the literature on value creation

in temporary organizations has focused on value creation in projects. Thus, both "value" and "project value" are terms that are used in this chapter.

In this dissertation, I adopt the following definition of value: "the quotient of benefits/costs (alternatively satisfaction of needs/use of resources)" (Laursen and Svejvig, 2016). Importantly, the division slash used in the definition indicates a quotient between the two elements — benefits and costs — rather than a numerical division.[2] In addition, both benefits and costs are conceptualized broadly, and they are not limited to monetary costs, for example. When analyzing the nature of value and value creation in temporary organizations, three focal characteristics can be identified: the lifecycle orientation, subjectivity, and multidimensionality of value. These are described in Table 2 and discussed further in the following.

Table 2. The three focal characteristics of value in temporary organizations.

Characteristic	Description
Lifecycle orientation	There are costs and benefits occurring throughout the project lifecycle, from the project front-end phase to the operation phase (e.g., Artto et al., 2016; Winter and Szczepanek, 2008).
Subjectivity	Value is a social construct and stakeholders assess and perceive value differently (e.g., Ang et al., 2016; Green and Sergeeva, 2019).
Multidimensionality	Value is not a unidimensional concept; it consists of multiple interrelated dimensions (e.g., short-term and long-term value) (e.g., Ahola et al., 2008; Ang et al., 2016; Green and Sergeeva, 2019; Martinsuo et al., 2019b; Martinsuo and Killen, 2014).

The core idea of project value is that determining the success of the project should not be limited to the fulfillment of the project goals (i.e., the project management phase). Instead, there are benefits and costs occurring throughout the project lifecycle that should be considered (Artto et al., 2016). In other words, value continues to be created after the project has been completed (Winter and Szczepanek, 2008). For instance, in infrastructure projects, the project deliverables can be in use for decades or even longer. The lifecycle viewpoint puts an emphasis on the criticality of front-end decisions (Artto et al., 2016; Matinheikki et al., 2016), proposes a distinction between "value creation" and "value capture" (Laursen and Svejvig, 2016), and directs attention to a wider range of relevant stakeholders (Ang et al., 2016; Green and Sergeeva, 2019), for example.

The lifecycle orientation of value is illustrated well by the literature on benefits management. Benefits management dates back to the late 1980s and it was originally concerned with the issue of ICT investments not achieving their expected benefits (Breese et al., 2015). More generally speaking, benefits management focuses on questions such as "What is the project's purpose?" (Zwikael and Smyrk, 2011, p.

[2] The Greek letter alpha (α) is often used instead of an equal sign (=) (Figure 3) to emphasize that this is a representation and not a quantitative division (Laursen and Svejvig, 2016).

17). A core idea of benefits management is the distinction between project outputs and project outcomes. According to Zwikael and Smyrk (2019), outputs are the direct results from a project (e.g., a building), while outcomes are the indirect end-effects generated as a consequence of the implementation of those outputs. The concepts "outcome" and "benefit" can be considered almost synonyms (Zwikael and Smyrk, 2019).

An especially important concept in the benefits management literature is "a target benefit" (Chih and Zwikael, 2015; Zwikael et al., 2018). Target benefits, also called project objectives (Zwikael et al., 2018), are set at the project front end and they define the strategic goals or desirable end-effects of the project, described by the project funder (Chih and Zwikael, 2015; Zwikael et al., 2018). This kind of strategic goal-setting can take place under various names, including for instance business cases (e.g., Musawir et al., 2017; Nielsen and Persson, 2017). However, even if target benefits are defined — or a business case is approved — at the project front end, value is created throughout the project lifecycle, and most value is realized at the operation phase (Zwikael and Smyrk, 2019). This important idea of lifecycle orientation of value creation is illustrated in Figure 3.

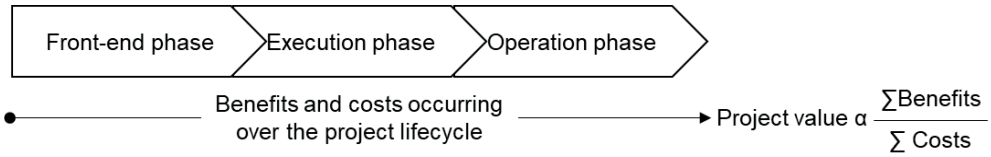

Figure 3. Project value occurring throughout the project lifecycle.

The subjective nature of value stems from the variety of stakeholders (Ang et al., 2016; Green and Sergeeva, 2019). While the product delivery perspective on projects (Winter and Szczepanek, 2008) is more limited to the viewpoints of the project supplier and the client, there is a wider range of relevant stakeholders to consider when taking the viewpoint of value creation (Ang et al., 2016; Green and Sergeeva, 2019). In many cases, it is difficult or even impossible to identify all the relevant stakeholders at the project front end (Green and Sergeeva, 2019). Importantly, as the number of stakeholders increases, so does the number of viewpoints to value. This is because value is a socially interpreted concept (Green and Sergeeva, 2019). In other words, value is subjective and is assessed and perceived differently by stakeholders (Ang et al., 2016; Laursen and Svejvig, 2016).

Value is also a multidimensional concept, and calls for a better understanding of the different dimensions of project value have been expressed (Winter and

Szczepanek, 2008). The following studies exemplify the different dimensions of value. In the context of purchasing and industrial turnkey projects, Ahola et al. (2008) divide value into short-term and long-term elements. The short-term benefits identified were related to products, delivery efficiency, support services, access to resources, and innovation. The long-term benefits were related to the relationship between the customer and the supplier and innovation. The respective costs were related to the direct and indirect costs of poor performance, operational transaction costs, strategic transaction costs, and negative effects on customer capabilities. In the context of project portfolios, Martinsuo and Killen (2014) put a special emphasis on the long-term and non-commercial dimensions of project value and the strategic nature of value. In their conceptual study, Martinsuo and Killen identified environmental and social value and learning and knowledge development as non-commercial dimensions of strategic value in project portfolios. In the third example, Ang et al. (2016) studied project value in the project portfolios of non-profit organizations. They identified seven 'value perspectives': singular or transactional value; generative or accumulative value; value networks and relationships; temporal orientation of value; value spectrum or range; transformational value; and personal reward. Most recently, Martinsuo et al. (2019b) have discussed framing value at the front end of infrastructure projects by identifying three dimensions of value: financial, social, and comparative value.

The four previous examples illustrate the multidimensional nature of project value. In the four studies, different elements of value (Ahola et al., 2008), dimensions of value (Martinsuo et al., 2019b; Martinsuo and Killen, 2014), or value perspectives (Ang et al., 2016) have been identified. The identified dimensions of value include non-commercial and monetary elements (Ahola et al., 2008; Martinsuo et al., 2019b; Martinsuo and Killen, 2014) and reveal different temporal perspectives on value (e.g., short-term vs. long-term in Ahola et al., 2008; retrospective–past–present–future orientation in Ang et al., 2016; and comparative value in Martinsuo et al., 2019b). The dimensions of value include both more strategic and more operational elements.

Finally, value creation is often studied in contexts of public-private collaboration (e.g., the delivery and operation of public infrastructure). A typical rationale for this kind of public-private collaboration is the expected higher efficiency of the private sector firms, in comparison to the public sector (de Bruijn and Dicke, 2006). However, according to critical voices, the potential benefits of higher efficiency are challenged by the threat of losing value in other ways. This challenging dilemma is typically studied under the title "public values". A public value can be defined as "a value government decides to try to safeguard following a public demand and within

the self-definition of the government role" (Steenhuisen and van Eeten, 2008, p. 147). Examples of public values include sustainability (Hueskes et al., 2017) and social responsibility (Zeng et al., 2015).

Public values provide an illustrative example of the three characteristics of value in temporary organizations. Regarding lifecycle orientation, competing public values (e.g., Koppenjan et al., 2008; Steenhuisen and van Eeten, 2008; van Gestel et al., 2008) are most evident in the operations phase. However, numerous decisions regarding the operations phase are made at the project front end and during the implementation phase. Regarding subjectivity, stakeholders can perceive public values differently and these subjective perceptions can lead to tradeoffs and competing public values (Koppenjan et al., 2008). Regarding multidimensionality, a highly illustrative example is yet again the competition between public values. For instance, Steenhuisen and van Eeten (2008) described competing public values faced by a Dutch train operator and identified strategies for coping with the competing public values.

2.1.2 Recent empirical research

The previous section described the basic idea of value in temporary organizations. Compared to the product delivery viewpoint, the management of value creation in a temporary organization can be considered significantly more challenging (Winter and Szczepanek, 2008). In this dissertation, it is argued that this difference especially stems from the three characteristics of value: lifecycle orientation, subjectivity, and multidimensionality. To discuss the issue of value creation in temporary organizations further, Table 3 summarizes the recent (2015–2019) empirical studies on this topic.

Table 3. Recent empirical research on value creation in temporary organizations.

Article	Method and context	Main findings
Ang et al., 2016	- Method: A qualitative two-case study - Context: Non-profit project portfolios	- A focus on the role of value in portfolio decision-making. - A typology of value perspectives: singular or transactional value; generative or accumulative value; value networks and relationships; temporal orientation of value; value spectrum or range; transformational value; and personal reward.
Artto et al., 2016	- Method: A qualitative single-case study. - Context: A shopping center project, a multi-organizational setting.	- A focus on the whole system lifecycle of the case project, especially the operations phase. - Four integration mechanisms that facilitate multi-organizational value creation in the operations phase: coordinating body, external image and internal identity, non-living technical system and living organizational system, and competing businesses and value.
Bos-de Vos et al., 2019	- Method: An interview-based approach. - Context: Architectural firms involved in construction projects.	- A focus on the value-capture phase and especially on value slippage (i.e., value created, but not captured [by the firm]). - Strategies for accepting or mitigating value slippage: postponing revenues in a project, compensating for the loss of revenue across projects, and rejecting a project.
Eskerod and Ang, 2017	- Method: A qualitative single-case study with a historical focus. - Context: An old highway bridge.	- A focus on stakeholders' value constructs. The project has been in the operations phase for an exceptionally long time (50 years). - Stakeholders emphasize value frameworks and value dimensions differently.
Eskerod et al., 2018	- Method: A qualitative single-case study. - Context: An old highway bridge (historical focus).	- A focus on project opportunity exploitation as a way to increase project value. - Opportunity exploitation requires the involvement of many stakeholders. Celebrating project achievements and promoting pride in the project can promote opportunity exploitation.
Hjelmbrekke et al., 2017	- Method: A qualitative two-case study. - Context: Construction projects.	- A focus on value creation from the perspective of the project owner (client). - The supplier's focus can be limited to project efficiency instead of project value. - Governance from the owner is required to secure the delivery of strategic value, which is especially important in the front end.
Lehtinen et al., 2019	- Method: A qualitative single-case study. - Context: A district development megaproject, a multi-organizational setting.	- A focus on value creation in a multi-organizational setting. - Value is created through jointly planned and governed design principles and through value-leveraging activities. - Value-leveraging activities are leader actors' coordination, competition among actors, and actors' value capture that is connected to project outcomes.
Martinsuo, 2019	- Method: A qualitative single-case study. - Context: A radical innovation program of a materials and systems manufacturer.	- A focus on the value perceptions of a multi-stakeholder business network at the program front end. - Three levels of strategic value at the program front end: firm, relationship, and business network. - Business, technical, solution, customer, and change readiness as requirements for implementing strategic value in a business network.
Martinsuo et al., 2019b	- Method: A comparative qualitative study. - Context: Transport infrastructure projects	- A focus on the framing of value by stakeholders (e.g., "why a project should (not) be funded") at the project front end. - Financial, social, and comparative value are dominant value dimensions. - Four themes of the lifecycle-oriented framing of value are: uncertainties, the timing of costs and benefits realization, project relations, and external sponsorship.
Matinheikki et al., 2016	- Method: A qualitative single-case study. - Context: Inter-organizational networks in a health care campus development project.	- A focus on value creation among multiple organizations at the project front end. - Value creation at the project front end requires the alignment of the different goals of multiple actors. - Front-end management requires relationship and trust building, inter-organizational coordination, joint decision-making, and shaping the divergent goals to create consensus and build a common vision.
Musawir et al., 2017	- Method: A quantitative survey (333 projects). - Context: Different projects; no criteria for project selection.	- A focus on the role of project governance in supporting benefits management. - Effective project governance improves project success both directly and through an enhanced benefits management process.
Riis et al., 2019	- Method: A qualitative multiple-case study (four cases). - Context: Large project-based companies from different industries.	- A focus on value creation from the perspective of the parent organization. - Governance of projects (GoP) promotes value creation by creating links between the permanent organization and the projects.
Svejvig et al., 2019	- Method: A qualitative multiple-case study (five cases). - Context: Five companies (different industries), four projects from each company.	- A focus on ways to accelerate time to impact (i.e., capture value faster). - Three areas of accelerating time to impact are: valuing speed, owning speed, and entraining speed in the organization.
Zwikael et al., 2018	- Method: A multi-method study with interviews and a survey - Context: Project management in general.	- A focus on the nature of effective target benefits. - Effectiveness of target benefits includes three dimensions: specificity, attainability, and comprehensiveness.

Several observations can be made based on Table 3 and the 14 recent empirical studies summarized. Foremost, the relatively large number of recent empirical studies confirms that interest in the topic is growing (Laursen and Svejvig, 2016; Martinsuo et al., 2019a). Nevertheless, the research designs of the studies indicate that the majority of the empirical work is still relatively explorative and lacks established theories.

The recent empirical studies have focused on all lifecycle phases, including the front-end phase (Hjelmbrekke et al., 2017; Martinsuo, 2019; Martinsuo et al., 2019b; Matinheikki et al., 2016; Musawir et al., 2017; Riis et al., 2019; Zwikael et al., 2018), the execution phase (Hjelmbrekke et al., 2017; Musawir et al., 2017; Riis et al., 2019), and the operations phase (Artto et al., 2016; Bos-de Vos et al., 2019; Eskerod et al., 2018; Eskerod and Ang, 2017). This confirms the centrality of the lifecycle view; in other words, it emphasizes the importance of studying value creation throughout the lifecycle of a temporary organization. However, only three studies examined the execution phase.

The importance of the viewpoint of numerous stakeholders and the subjectivity of value (Green and Sergeeva, 2019) is confirmed by the recent empirical evidence as well. A few of the recent studies have explicitly taken a multi-organizational or multi-stakeholder viewpoint on the delivery of value (Ang et al., 2016; Artto et al., 2016; Eskerod et al., 2018; Eskerod and Ang, 2017; Lehtinen et al., 2019b; Martinsuo, 2019; Martinsuo et al., 2019b; Matinheikki et al., 2016). The focus of the other studies, while not explicitly multi-organizational or multi-stakeholder, is on different stakeholders as well, including the parent organization (Musawir et al., 2017; Riis et al., 2019) and the client (Hjelmbrekke et al., 2017), for example.

Although most of the recent empirical studies acknowledge the multidimensionality of value, only a few have discussed this aspect explicitly (Ang et al., 2016; Eskerod and Ang, 2017; Martinsuo, 2019; Martinsuo et al., 2019b). Although focused on different lifecycle phases — Martinsuo (2019; Martinsuo et al., 2019b) on the front-end phase and Eskerod and Ang (2017) on the operations phase — and on different types of temporary organizations, projects (Eskerod and Ang, 2017; Martinsuo, 2019; Martinsuo et al., 2019b), and project portfolios (Ang et al., 2016), all four studies illustrate how stakeholders perceive or emphasize value dimensions differently. However, there is still an evident need for further research studying the implications of the multidimensionality of value.

To summarize, the recent empirical evidence has confirmed the criticality of the three characteristics of value — lifecycle orientation, subjectivity, and multidimensionality — for value creation in temporary organizations. However, for

all three characteristics, a few important knowledge gaps remain. These knowledge gaps will be discussed from different viewpoints throughout this dissertation.

2.2 Encouraging desirable action: Organizational control in temporary organizations

> *"To control means seeing that everything occurs in conformity with established rule and expressed command."*
>
> (Fayol, 1949, cited in Lamond, 2003, p. 7)

If all personnel acted in the best interests of the organization, no control — or even management — would be needed (Merchant, 1982). However, due to personal limitations and goal incongruence, for example, the actions of personnel and the goals of organizations are not automatically aligned (Merchant, 1982). Consequently, control is needed. As cited above, the goal of control is to ensure conformity with plans or, in other words, "[to] direct attention, motivate, and encourage organizational members to act in ways desirable to achieving the organization's objectives" (Cardinal et al., 2010, pp. 56–57).

There is a strong stream of literature on control, often called organizational control or management control, in permanent organizations. This stream of literature has its roots in general management and management accounting (e.g., Anthony, 1988; Anthony et al., 1980). More recently, scholars have studied control in temporary organizations as well. This section focuses on organizational control in temporary organizations.

2.2.1 Key concepts

Two general streams of literature on control in temporary organizations can be identified. The first stream focuses on analytical project control, especially earned value management (EVM). This stream has a relatively long history and remains active in further developing analytical and statistical control tools (e.g., Willems and Vanhoucke, 2015). The second stream, labeled here as organizational control, considers control from a behavioral viewpoint. The core idea of organizational control is that different control mechanisms (e.g., plans or rules) and control modes (e.g., formal vs. informal control) are used to encourage or ensure desirable actions (Cardinal et al., 2010). Desirable actions are not limited to progress in terms of

schedule and financial goals (cf. Willems and Vanhoucke, 2015), but the focus is on the goals of a temporary organization in a broader sense. In this dissertation, control in temporary organizations is addressed from the organizational control viewpoint.

Following the organizational control viewpoint, key concepts of control include control mechanisms and control modes, control packages, and controllers and controllees. These concepts and their relations are described next. This section builds strongly on the review articles written by Cardinal et al. (2010) and Wiener et al. (2016).

Control mechanisms are the practical ways through which control is exerted (e.g., schedules, budgets, rules, and reporting). Traditionally, control mechanisms have been divided into formal and informal mechanisms, but more recent research has argued that the formality of control is a different analytical dimension (Whitley, 1999) and many individual control mechanisms can be utilized both formally and informally (Cardinal et al., 2010).

Similar control mechanisms are grouped into control modes (Wiener et al., 2016) based on the target of control (Cardinal et al., 2010). In his seminal work on permanent organizations, Ouchi (1978, 1977) proposes dividing control modes into behavior (or process) and outcome (or output) control. Subsequently, additional control modes have been identified, including clan control (Ouchi, 1980, 1979), input control (Jaworski, 1988), and self-control (Henderson and Lee, 1992; Jaworski, 1988).

Related to the concepts of control mechanisms and control modes, another stream of literature has studied the antecedents of control (e.g., Ouchi, 1977); or, in other words, the factors that explain the utilization of specific control mechanisms and control modes (Wiener et al., 2016). Regarding control in temporary organizations, numerous studies have analyzed whether the same antecedents of control identified in permanent organizations are applicable to temporary organizations as well (e.g., Choudhury and Sabherwal, 2003; Heumann et al., 2015; Kirsch, 1997, 1996; Kirsch et al., 2010, 2002; Liu et al., 2014; Rustagi et al., 2008; Sakka et al., 2013).

The strong focus on the antecedents of control has led to a more nuanced understanding of the complementary versus the substitute roles of control mechanisms and control modes (Tiwana, 2010). In particular, concepts such as control portfolios (Kirsch, 1997), control packages (Malmi and Brown, 2008), and management control systems (Chenhall, 2003) have been proposed. Despite the differences in terminology, all three concepts refer to the same idea of control being practiced through a combination of control mechanisms and control modes (see

Figure 4). This configurative idea of control is widely accepted in the literature on control in temporary organizations (e.g., Choudhury and Sabherwal, 2003; Kirsch, 1997; Soh et al., 2011; Tuuli et al., 2010; Wiener et al., 2016). The focus on the antecedents of control is still relevant, but it refers more to different control configurations than restrictive selections. Of the three alternative labels, this dissertation uses "control package" to prevent confusion with project portfolios.

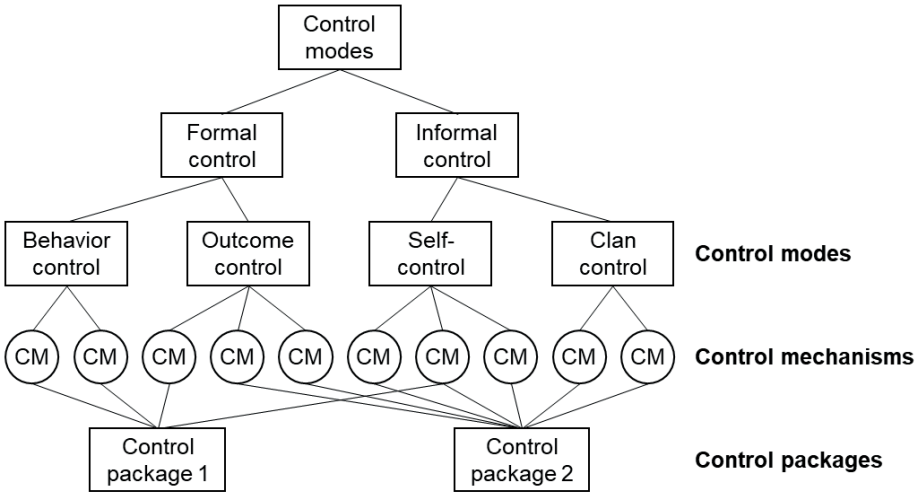

Figure 4. Hierarchy of control modes, control mechanisms, and control packages (adapted from Choudhury and Sabherwal, 2003).

The final key concepts are controllers and controllees. These two terms refer to the question of "who controls whom" (i.e., a controller controls a controllee). The early studies on control in permanent organizations focused especially on the control relationship between managers and their subordinates. In a similar vein, several studies on temporary organizations have focused on the project or program manager as the controller (e.g., Henderson and Lee, 1992; Nieminen and Lehtonen, 2008). Another typical viewpoint, especially in IS (information system) projects, has been to perceive a client as controlling a vendor (e.g., Kirsch et al., 2002; Tiwana, 2010). Viewing the client as a controller expands the focus of control to inter-organizational settings. Despite the focus on different controller–controllee pairs, the clear majority of the existing literature has focused on dyadic control relationships (Heumann et al., 2015). Fewer studies have analyzed how control is performed by different controllers or exerted over different controllees (Heumann et al., 2015; Soh et al., 2011).

2.2.2 Recent empirical research

The previous sections have described the basic premise and key concepts of organizational control in temporary organizations; however, they have not focused on the most recent developments in the field – particularly the relationship between value creation and control. Consequently, recent (2015–2019) empirical evidence on organizational control in temporary organizations is discussed next. A study was considered relevant if it approached control from the viewpoint of organizational control (i.e., terms like 'control mechanism' were used). Consequently, the EVM literature, for example, was excluded.

When analyzing the recent empirical studies, they could clearly be divided into two groups. The first focused on the effects of control on project performance or project success, and the second focused on the nature of control in temporary organizations. These groups of empirical studies are summarized in Tables 4 and 5, respectively.

Table 4. Recent empirical research on the effects of control on project performance or project success in temporary organizations.

Article	Method and context	Main findings
Hsu et al., 2017	- Method: A quantitative survey (220 respondents). - Context: IS projects.	- A focus on the influence of control on teamwork and the consequent effects on project performance. - Formal and informal control have a positive influence on teamwork and performance.
Kanwal et al., 2017	- Method: A quantitative survey (262 respondents). - Context: IS projects.	- Clan control and outcome control have a positive influence on project performance, moderated by resource commitment and top management support.
Liu, 2015	- Method: A quantitative survey (128 projects). - Context: IS projects.	- Behavior, outcome, clan, and self-control have a positive influence on project performance. - Complexity risk moderates the relationship. High risk: the effects of behavior and self-control are lower and the effects of outcome and clan control are higher.
Liu and Wang, 2016	- Method: A quantitative survey (195 projects). - Context: Medical IS projects.	- Behavior, outcome, and clan control have a positive influence on project performance. - The performance effects are moderated (diminished) by organizational environment and team risks.
Lu et al., 2017	- Method: A quantitative survey (243 respondents). - Context: NPD projects in a multi-organizational setting.	- Intra-organizational formal control and inter-organizational trust affect project performance positively. - Intra-organizational professional control and inter-organizational contract control have no significant performance effects.
Mähring et al., 2018	- Method: A quantitative survey (86 projects). - Context: IS projects in a client–vendor setting.	- Highlights the role of control transmission. - Both behavior and outcome control can be transmitted, but only the transmission of outcome control has a positive effect on performance.
Sakka et al., 2016	- Method: A quantitative survey (93 projects). - Context: IS projects.	- A focus on the utilization of interactive control. - Project uncertainty and equivocality moderate performance. High (low) uncertainty and equivocality yield positive (negative) effects.
Wiener et al., 2015	- Method: A quantitative survey (86 projects). - Context: IS projects in a client–vendor setting.	- A focus on the promotion of informal control. - Clan control is more difficult to promote than self-control, but only clan control has a direct positive effect on performance.
Zheng et al., 2018	- Method: A quantitative survey (203 projects). - Context: IS projects in a client–vendor setting.	- A focus on the interactive effects of client and vendor-driven control. - Client process control enhances the effect of vendor outcome control, yet it impairs the effect of vendor process control. The opposite pattern is found for client outcome control. - Client relational control enhances the effects of both vendor process and outcome control, whereas client clan control only enhances the effect of client outcome control.

The large number of studies listed in Table 4 demonstrates that there is still (cf. Wiener et al., 2016) a strong interest in studying the effects of control on project performance or project success. Both the studies listed in Table 4 and the earlier-published literature on the topic (Wiener et al., 2016) demonstrate a general positive relationship between control and project performance.

Building on the generally positive relationship between control and project performance, the recent empirical studies have focused on more nuanced aspects of the control–performance relationship. Examples include the performance effects of specific control modes (Liu, 2015; Liu and Wang, 2016; Lu et al., 2017; Wiener et al., 2015), the moderators between control and performance (Kanwal et al., 2017; Liu, 2015; Liu and Wang, 2016; Sakka et al., 2016), and the interactions of control modes (Zheng et al., 2018). Inter-organizational settings, especially IS outsourcing (Wiener et al., 2016), have recently attracted attention as well (Lu et al., 2017; Mähring et al., 2018; Wiener et al., 2015; Zheng et al., 2018).

This dissertation does not study the performance effects of control. However, the recent studies listed in Table 4 and the literature review carried out by Wiener et al. (2016) confirm the importance of control and justify the study of control in temporary organizations.

Table 5. Recent empirical research on the nature of control in temporary organizations.

Article	Method and context	Main findings
Chua and Myers, 2018	- Method: A qualitative single-case study. - Context: IS project in the agricultural industry, a client–vendor setting.	- A focus on the actuality of control in projects. - Instead of being imposed by controllers or controlees, control should be studied from a social perspective that sees control as negotiated orders.
Heumann et al., 2015	- Method: A qualitative single-case study. - Context: IS project in the engineering industry.	- A focus on control practiced across different levels of the organizational hierarchy. - A typology of control modes supplemented with the dimension of control style. Two control styles — enabling and coercive control — and their antecedents are identified.
Mähring et al., 2018	- Method: A quantitative survey (86 projects). - Context: IS projects in a client–vendor setting.	- Highlights the role of control transmission. - Control transmission refers to the difference between 'control given' and 'control received'. - In a client–vendor relationship, both behavior and outcome control have the capacity to transmit consistently.
Sakka et al., 2016	- Method: A quantitative survey (93 projects). - Context: IS projects.	- Emphasizes the selective utilization of interactive control. - Interactive control refers to the controller's personal engagement in the controllee's work.
Wiener et al., 2015	- Method: A quantitative survey (86 projects). - Context: IS projects in a client–vendor setting.	- A focus on the promotion of informal control. - Clan control is more difficult to promote than self-control, but only clan control has a direct positive effect on performance.

In contrast to Table 4, Table 5 tracks the more recent and growing scholarly interest in understanding the "how" aspects of control in temporary organizations (Wiener

et al., 2016). Examples of the "how" aspects include the promotion or transmission of control (Mähring et al., 2018; Wiener et al., 2015), control styles (Gregory and Keil, 2014; Heumann et al., 2015), and control practiced by different actors or at different organizational levels (Heumann et al., 2015; Korhonen et al., 2014). As a whole, there is a coherent call for additional research on control in practice in different contexts (Chua and Myers, 2018; Wiener et al., 2016)

Regarding control and value creation, there are several limitations found —even in the most recent literature. One key limitation relates to the consideration of project success or project performance. Most of the performance-oriented studies (Table 4) focus either on project efficiency (i.e., the performance of the project delivery process) and/or project quality (i.e., the performance of the delivered product) (Wiener et al., 2016). These two viewpoints quite strongly resemble the traditional iron triangle objectives (Atkinson, 1999). Importantly, even the project quality viewpoint takes the "product delivery" view of projects (Winter and Szczepanek, 2008) rather than the value creation view.

The issue of goal incongruence between actors (related to the subjectivity of value) is acknowledged in a few studies as a reason for control (Zheng et al., 2018). However, none of the recent empirical studies in either of the two groups have considered the goals of a temporary organization as value oriented or explicitly acknowledged the multidimensional and lifecycle-oriented nature of value. In other words, none of the recent empirical studies have addressed the question of encouraging action toward different dimensions of project value. By addressing this viewpoint, contributions could be sought both from the "what" (i.e., what kinds of control mechanisms and modes are utilized in value-oriented temporary organizations?) and the "how" (i.e., how is control used to promote the achievement of value-oriented goals in temporary organizations?) perspectives of control.

2.3 Managing organizational interdependencies: Coordination and integration in temporary organizations

> *"To co-ordinate means binding together, unifying and harmonizing all activity and effort."*
>
> (Fayol, 1949, cited in Lamond, 2003, p. 7)

In all organizations, whether they are permanent or temporary, work is divided among various organizational subsystems. Examples of these subsystems include the functions of a permanent organization and the projects, subprojects, or teams of a

temporary organization. Although this organizational differentiation is vital for success (e.g., Lawrence and Lorsch, 1967), it creates interdependencies between the organizational subsystems. The management of these interdependencies is called coordination or integration (e.g., Van de Ven et al., 1976).

In the literature, the terms "coordination" and "integration" are at times used vaguely or even interchangeably (Dietrich, 2007). This issue is exemplified by the often cited definition of coordination by Van de Ven et al. (1976, p. 322), in which "*coordination* means *integrating* or linking together different parts of an organization to accomplish a collective set of tasks" (emphasis added). The same issue is evident in the words used more recently by Faraj and Xiao (2006, p. 1156): "at its core, *coordination* is about the *integration* of organizational work under conditions of task interdependence and uncertainty" (emphasis added). In this chapter, both coordination and integration are considered as ways of managing organizational interdependencies.

2.3.1 Key concepts

The dominant approach for studying coordination and integration is to identify coordination or integration mechanisms. Similar mechanisms are typically classified into coordination or integration modes. There is a strong resemblance to the conceptualizations of organizational control.

Coordination or integration mechanisms refer to the practical ways of pursuing aligned action. The mechanisms are highly context dependent, but examples in temporary organizations include different meetings, coordinating roles, direct contacts between people, reporting, plans, and schedules (Dietrich, 2006).

Coordination or integration modes group together similar coordination or integration mechanisms. In one of the most cited classifications, Van de Ven et al. (1976) groups coordination mechanisms into impersonal, personal, and group modes. Similar classifications have been used by Dietrich (Dietrich, 2006; Dietrich et al., 2013) to analyze coordination and by Turkulainen et al. (2015) to analyze integration in temporary organizations, for example.

The concepts of coordination or integration mechanisms and modes propose taking a contextual approach to coordination and integration. Consequently, several authors have studied the antecedents or performance effects of coordination and integration in different contexts, including permanent (e.g., Van de Ven et al., 1976)

and temporary organizations (Dietrich, 2006; Dietrich et al., 2013; Hoegl et al., 2004; Turkulainen et al., 2015).

Concepts such as coordination or integration mechanisms and coordination or integration modes paint a relatively static picture of coordination or integration in organizations. A recent example of a viewpoint building on this potential limitation is the distinction between *coordination* and *coordinating* (Jarzabkowski et al., 2011). Proposing a distinction between these two concepts, Jarzabkowski et al. (2011) emphasize the dynamic and social nature of coordinating and the need to study it from a practice viewpoint.

2.3.2 Recent empirical research

The previous discussion has described the key ideas and established concepts of coordination and integration. Coordination and integration can be seen as ways of managing organizational interdependencies, conceptualized as the utilization of combinations of coordination or integration mechanisms. However, the mere concepts of coordination and integration mechanisms (or modes) do not address the more nuanced nature of coordination or integration in practice; in other words, they do not address the "how" aspects of these phenomena. In particular, the previous literature and the key concepts do little to acknowledge the value-oriented goals of temporary organizations. To address these shortcomings, recent (2015–2019) empirical studies on coordination and integration in temporary organizations are analyzed next.

Because the terms "coordination" and "integration" are used in the literature quite vaguely at times, two rules for selecting the empirical studies were formulated. First, a study was considered relevant if it addressed coordination or integration from the perspective of managing organizational interdependencies. Examples of the excluded streams of literature include systems integration (Davies and Mackenzie, 2014), supplier integration (Ahola et al., 2017), and cross-functional integration (Ståhle et al., 2019). Second, the focus of the study had to be on coordination or integration in temporary organizations.

When analyzing the recent empirical studies, the studies were clearly divided into two groups: coordination or integration in intra-organizational temporary organizations and in inter-organizational temporary organizations. These groups of empirical studies are summarized in Tables 6 and 7, respectively.

Table 6. Recent empirical studies on coordination or integration in intra-organizational temporary organizations.

Article	Method and context	Main findings
Bick et al., 2018	- Context: Software development. - Method: A qualitative single-case study.	A lack of dependency awareness as a key explanation of inefficient coordination in software development.
Dingsøyr et al., 2017	- Context: Software development. - Method: A qualitative two-case study.	- A focus on the group mode of coordination, especially meetings. - Changes in coordination mechanisms over time: from scheduled to unscheduled meetings and vice versa.
Dingsøyr et al., 2018	- Context: Software development. - Method: A qualitative single-case study.	- A variety of coordination mechanisms in use. - Coordination is not static, and the utilized coordination mechanisms change over time (e.g., a gradual transition to unscheduled meetings).
Turkulainen et al., 2015	- Context: Multi-project programs. - Method: A qualitative single-case study.	- A focus on two integration interfaces in multi-project programs: project-to-project and project-to-organization integration. - Integration is contingent on the interface; different integration mechanisms are used in the two integration interfaces.

Table 7. Recent empirical studies on coordination or integration in inter-organizational temporary organizations.

Article	Method and context	Main findings
Aagaard et al., 2015	- Context: Sub-contractors in the offshore wind power energy sector. - Method: A qualitative multiple-case study.	- A focus on the drivers of and barriers to informal coordination among sub-contractors. - Drivers: Trust and good chemistry; risks and related costs; successful collaboration history; prospects for future collaboration; low level of client satisfaction during a project; low number of employees. - Barriers: High task uncertainty; high economic impact of adaptations and adjustments; tight economic constraints.
Bygballe et al., 2016	- Context: Construction projects. - Method: A qualitative multiple-case study.	- Coordinating as a bottom-up and emergent process. - Synchronized readiness as a relational enabler of future coordination
Hietajärvi et al., 2017	- Context: Infrastructure projects. - Method: A qualitative two-case study.	- Integration changes throughout a project. - The project lifecycle phase, unexpected events, and project team's learning as triggers for changes in integration.
Lavikka et al., 2015	- Context: Construction projects. - Method: A comparative two-case study.	- The comparison of coordination in two contractually different construction projects. - The timing and extent of complementary coordination (in addition to contractual coordination) depends on the contract type.
Peters and Pressey, 2016	- Context: Construction project networks. - Method: A qualitative two-case study.	- There are three types of coordination practices (or "scaffolding practices") in temporary networks: consistency, consensus, and co-constitutiveness.

By analyzing the recent empirical research (Tables 6 and 7), it is clear that two contexts are predominant: software development and construction projects. Consequently, most of the studies have focused on relatively large or innovative temporary organizations. In contrast, there is a lot less evidence on the practices of coordination or integration in smaller or less innovative contexts.

Most of the recent empirical studies do focus on the coordination or integration mechanisms used in different contexts. A few of the studies have emphasized the contingent nature of coordination and integration as well (Lavikka et al., 2015; Turkulainen et al., 2015). However, the recent studies have also highlighted aspects such as the dynamic nature of coordination and integration (Dingsøyr et al., 2018, 2017; Hietajärvi et al., 2017) and the barriers, enablers, or drivers of coordinated action (Aagaard et al., 2015; Bick et al., 2018; Bygballe et al., 2016). These kinds of findings illustrate a shift away from a focus on "what" questions and a movement toward "how" questions and a better understanding of coordination and integration in practice; in other words, they point to a better understanding of the social dynamics of coordination and integration (Jarzabkowski et al., 2011).

Regarding value creation, none of the recent empirical studies have focused explicitly on value creation in temporary organizations. The viewpoint of value is typically covered more implicitly by acknowledging the potential problems (e.g., delays) caused by a lack of coordination or integration. These problems could be seen as potential losses of value. As another example, Turkulainen et al. (2015) mention briefly the issue of justifying major investments, implicitly indicating the potential for value creation.

In this dissertation, coordination and integration are seen as procedures for value creation in two ways. The first is to prevent the loss of value by ensuring coordinated or integrated action. The second emphasizes the interface between the temporary and the permanent organization. It is argued that coordination or integration is required to ensure value creation for the permanent organization.

2.4 Influencing temporary organizations from the outside: The stakeholder viewpoint

> *"Business is about how customers, suppliers, employees, financiers (stockholders, bondholders, banks, etc.), communities, and managers interact and create value. To understand a business is to know how these relationships work."*
>
> (Freeman et al., 2010, p. 24)

The two previous sections on control and coordination and integration have focused on the internal functions of management (Fayol, 1949). However, a temporary organization influences and is influenced by external organizations and actors as well (Jacobsson et al., 2015). The idea of external influences relates to the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller,

2003). In this dissertation, the external viewpoint of managing a temporary organization is addressed from the perspective of the stakeholder theory.

The stakeholder view of temporary organizing has its roots in two seminal studies. In 1984, Freeman introduced the concepts of stakeholders and stakeholder management to the general management literature. Two years later, Cleland (1986) brought the concepts into the project management literature. Over the following decades, stakeholder management has gained a strong position in both the practitioner guidelines (PMI, 2017) and in the project management literature (Littau et al., 2010; Mok et al., 2015).

In Freeman's classical work (1984, p. 46), a stakeholder is defined as "any group or individual that can affect or is affected by the achievement of an organisation's objectives." However, in the decades that followed, no consensus could be reached on defining stakeholders and numerous competing definitions have since been provided (Laplume et al., 2008; McGrath and Whitty, 2017; Miles, 2017). This potentially interesting theoretical debate is beyond the scope of this dissertation. Instead, the variant of Freeman's (1984) original definition that is typically used in project management is used, which defines a stakeholder as "any group or individual who can affect or is affected by the project" (Aaltonen et al., 2008, p. 509)

Stemming both from the definition of a stakeholder and by analyzing the stakeholder management literature, two general viewpoints to stakeholder management can be identified. The first is the viewpoint of the project or the focal firm. The central question is: how are stakeholders managed [by the focal firm or the project]? This viewpoint has received the most scholarly attention, illustrated both by the number of publications available (Laplume et al., 2008) and the number of highly cited studies (e.g., Donaldson and Preston, 1995; Freeman, 1984; Mitchell et al., 1997).

The second viewpoint is that of the stakeholders themselves. Here, the key question is: how do stakeholders influence the project or focal firm? In comparison to the viewpoint of the project or the focal firm, the viewpoint of the stakeholders has received less attention, both in the literature in general (Laplume et al., 2008) and in the literature on temporary organizations in particular (Aaltonen and Kujala, 2010; Mok et al., 2015). In a similar vein, the practitioner guidelines (PMI, 2017) place a greater emphasis on the role of the project and the focal firm.

Increasing our understanding of the actions and considerations of the stakeholders themselves can rectify the imbalance in the literature (Aaltonen and Kujala, 2010; Mok et al., 2015), acknowledge better the subjective nature of value, and benefit the development of the practitioner guidelines (PMI, 2017). The need

for additional research is illustrated by the calls for management "for" rather than "of" stakeholders as well (Eskerod and Huemann, 2016). There seems to be a growing interest in this viewpoint in the general stakeholder literature as well (Laplume et al., 2008). Thus, in this dissertation, the focus is on the stakeholder viewpoint.

2.4.1 Key concepts

The core idea of the stakeholder view is that stakeholders set claims on the project or the focal firm in order to pursue their interests. In other words, stakeholders try to influence the project or the decision-makers (Nguyen et al., 2019). The two key questions are: how does the project or the focal firm evaluate and prioritize the stakeholder claims, and in which ways do stakeholders set their claims and seek to influence the project or the focal firm?

Due to the large number of stakeholders and stakeholder claims, not all claims can be addressed by the project or the focal firm. Stakeholder salience is a way to understand this evaluation and prioritization. The stakeholder salience framework, which was introduced by Mitchell et al. (1997), studies stakeholder claims from the perspectives of power, legitimacy, and urgency. The higher a stakeholder claim scores in terms of the three perspectives, the more salient it is considered to be (Aaltonen et al., 2015; Mitchell et al., 1997). More salient claims are more likely to be prioritized by decision-makers. More recent studies have demonstrated that stakeholder salience is not a static measure, but it is affected by the actions of the focal firm, the stakeholders, and by contextual attributes (Aaltonen et al., 2015, 2008).

In terms of affecting and seeking influence, the key concept is stakeholder influence strategy. In a seminal article on this topic, Frooman (1999) proposed four types of stakeholder influence strategies: direct withholding, indirect withholding, direct usage, and indirect usage. In addition, Frooman (1999) set up propositions for the antecedents of selecting an influence strategy. More recently, this concept has been empirically studied in temporary organizations as well (Aaltonen et al., 2008; Aaltonen and Kujala, 2010). These studies have demonstrated a wider range of potential influence strategies in temporary organizations, adding resource building, coalition building, conflict escalation, communication and credibility building, and direct action to Frooman's (1999) original list of strategies.

Finally, the viewpoint of value creation has received increasing attention in the recent stakeholder literature (Freeman et al., 2019; Kujala et al., 2019; Myllykangas et al., 2010). Key questions include, whether business logic should serve only the owners or create value for all stakeholders, the collaborative or competitive nature of stakeholder relationships, and the broadening of organizational goals beyond profit maximization, for example (Freeman et al., 2019; Kujala et al., 2019; Myllykangas et al., 2010). There is a strong resemblance with the three characteristics of value highlighted in this dissertation, especially the multidimensionality and subjectivity of value.

Regarding stakeholder management in temporary organizations in particular, the viewpoint of value creation is evident on topics such as value co-creation and stakeholder engagement. Value co-creation relates to the collaborative nature of stakeholder relationships; studies on this area describe how stakeholders, instead of negative competition and partial optimization, create or define value together (e.g., Fuentes et al., 2019; Liu et al., 2019; Smyth et al., 2018). Stakeholder engagement relates to collaboration between the focal firm and the stakeholders, and especially to the engagement of stakeholders in decision-making. Recent studies have covered topics such as engagement strategies, practices and rationales for stakeholder engagement and disengagement, and the benefits, challenges and consequences of stakeholder engagement (e.g., Aaltonen et al., 2015; Eskerod et al., 2016; Lehtinen et al., 2019a), for example. Taken together, concepts such as value co-creation and stakeholder engagement, and the overall topic of value creation in stakeholder management, illustrate the calls for the viewpoint of "management for stakeholders", instead of "management of stakeholders" (Eskerod and Huemann, 2014).

2.4.2 Recent empirical research

The previous sections have discussed the basic ideas of the stakeholder viewpoint on stakeholder management. This viewpoint is rooted in the concepts of stakeholder salience (Mitchell et al., 1997) and stakeholder influence strategies (Frooman, 1999). However, the basic concepts of stakeholder salience and stakeholder influence strategies do little to describe the more nuanced nature and the dynamics of stakeholders' actions. To address this, recent (2015–2019) empirical evidence on stakeholder management in temporary organizations is discussed here.

In keeping with the focus of the dissertation, the analysis is limited to studies focusing on the viewpoint of stakeholders themselves, instead of on the viewpoint

of the project or the focal firm. Accordingly, topics such as stakeholder classification are excluded. The relevant recent empirical studies are summarized in Table 8.

Table 8. Recent empirical research on stakeholder influences in temporary organizations.

Article	Method and context	Main findings
Aaltonen et al., 2015	- Method: A qualitative two-case study. - Context: Nuclear waste repository projects at the front-end phase.	- A focus on the dynamics of stakeholder salience and position (level of support) at the project front end. - Salience and position are shaped by stakeholder influence actions, stakeholder management strategies, and contextual conditions.
Aragonés-Beltrán et al., 2017	- Method: An illustrative empirical case. - Context: A railway maintenance project.	- A quantitative method (analytic network process, ANP) for assessing stakeholders' influence on a project.
Cuppen et al., 2016	- Method: An illustrative empirical case. - Context: A shale gas exploration project.	- Focus on stakeholder engagement. - "Q methodology" is a way to analyze stakeholders' perceptions of a project. - The perceptions are more nuanced than a division between proponents and opponents.
Davis, 2017	- Method: A literature review and interviews. - Context: Senior and project managers and project recipients.	- A focus on the different stakeholder groups' perceptions of project success. - The accountability of and benefit to the stakeholder group are proposed as additional viewpoints in addition to the 'iron triangle.'
Liu et al., 2018	- Method: A mixed-method two-case study. - Context: Large construction projects.	- A focus on collective actions against large construction projects. - Six factors: Benefits of the public, characteristics of project performers, layout of projects, living quality of the public, perceptions of the public, and influences of the authority.
Mok et al., 2017	- Method: A qualitative single-case study. - Context: A large reclamation project.	- A focus on stakeholders' concerns and concern interdependencies. - Five key concerns: Complex construction technology, environmental disruptions, public and community consultation, site constraints, and government standards.
Nguyen et al., 2019	- Method: A qualitative multiple-case study (four cases). - Context: Construction projects.	- Focus on external stakeholder influences. - Direct bolstering and lobbying strategies. - Direct strategies are targeted at a project and lobbying strategies at a decision-maker. - Lobbying and bolstering strategies are used in combination.
Purvis et al., 2015	- Method: A qualitative three-case study. - Context: PM process implementation.	- Expectancy theory as a way to understand the willingness of stakeholder engagement. - Psychological and organizational climates affect the stakeholders' willingness to participate in a project.
van den Ende and van Marrewijk, 2019	- Method: A qualitative, longitudinal, two-case study. - Context: Infrastructure projects.	- A focus on community resistance against large-scale infrastructure projects. - Social unrest and community resistance are generated by insufficient legitimation. Institutional response actions are taken by the project actors.

Table 8 can be used to make several observations. Generally speaking, the relatively large number of recent studies demonstrates the growing interest in the stakeholders' viewpoint of stakeholder management (Aaltonen and Kujala, 2010; Mok et al., 2015). By analyzing the nine recent studies further, they can be divided into two groups. The first group of studies focuses on stakeholders' influence actions or influence strategies (Aaltonen et al., 2015; Nguyen et al., 2019; van den Ende and van Marrewijk, 2019). In other words, these studies are interested in how stakeholders influence projects. The second group of studies discusses the various perceptions, values, and viewpoints of stakeholders (Cuppen et al., 2016; Davis, 2017; Liu et al., 2018; Mok et al., 2017; Purvis et al., 2015). In other words, the focus of the second

group is on the reasons for stakeholders' attitudes (e.g., supportive versus non-supportive) toward projects.

The first group of studies has revealed the various influence strategies used by different stakeholder groups. The second group of studies has demonstrated the different viewpoints explaining stakeholders' attitudes toward projects. There is clear potential to combine these two viewpoints, but only a few implicit examples can be found that contribute to filling this gap. Regarding those few exceptions, van den Ende and van Marrewijk (van den Ende and van Marrewijk, 2019) discuss social unrest and community resistance caused by insufficient legitimation, but they do not make explicit connections between the reasons for and the utilized influence actions of the stakeholders. Conversely, Liu et al. (2018) focus on collective actions against major construction projects. They identify a variety of reasons to oppose projects, but they discuss the linkages between the reasons and the specific actions only implicitly.

Linking together the two groups of studies — stakeholder influence strategies and the viewpoints of stakeholders — provides a fruitful avenue for considering the viewpoint of value in this context as well. None of the studies in Table 8 explicitly consider the viewpoint of value. However, the findings, including "benefit to the stakeholder" (Davis, 2017), "benefits, living quality and perceptions of the public" (Liu et al., 2018), and "environmental disruptions" (Mok et al., 2017), strongly resemble the core ideas of value in temporary organizations. Thus, the analysis of the recent empirical literature reveals the potential to combine the literature on stakeholder influence actions and the reasons for stakeholders' attitudes into a value creation viewpoint.

2.5 Synthesis: Key questions for managing value creation in a temporary organization

Section 2.1 discussed temporary organizations as vehicles for value creation. Sections 2.2 to 2.4 analyzed three viewpoints — control, coordination and integration, and the stakeholder viewpoint — to managing value creation in temporary organizations. In section 2.1, three characteristics of value were identified: lifecycle orientation, subjectivity, and multidimensionality. Combining the three characteristics of value and the three management viewpoints reveals the need for further research on managing value creation, thereby justifying the need for this project.

A key question regarding control is the nature of organizational objectives. The objectives of organizational control are "[to] direct attention, motivate, and encourage organizational members to act in ways desirable to achieving the organization's objectives" (Cardinal et al., 2010, pp. 56–57). Although recent empirical studies have provided a more nuanced understanding of the "how" aspects of control in temporary organizations (Wiener et al., 2016), they have done little to address the subjectivity and multidimensionality of project value. In other words, there remains a need to understand better the question of encouraging action toward value-oriented project goals and the different dimensions of project value.

Regarding coordination and integration, in this dissertation they are seen as procedures for managing organizational interdependencies. The earlier literature on coordination and integration touches upon value creation only implicitly. However, as instructed by the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003) and by the literature on integration in multi-project programs (Dietrich et al., 2013; Lehtonen and Martinsuo, 2009; Turkulainen et al., 2015), for example, there are interdependencies within temporary organizations and between temporary organizations and permanent organizations. These interdependencies are the key areas for value creation (or loss of value) in temporary organizations. Thus, this dissertation focuses on coordination and integration as ways of managing value creation, especially within those interdependencies.

In terms of stakeholder theory, rather than focusing on the viewpoints of the project or the focal firm, which is what the earlier literature mostly focused on (Aaltonen and Kujala, 2010; Mok et al., 2015), this dissertation focuses on the viewpoint of the stakeholders themselves. Following this viewpoint, key questions include how and why stakeholders seek to influence projects. The recent empirical studies have touched upon both of these questions by studying different stakeholder influence actions and influence strategies and by analyzing the various perceptions, values, and viewpoints of stakeholders. However, none of them has explicitly combined these two viewpoints. This leaves the question of how the subjectivity of multidimensional value can explain stakeholders' influence efforts on projects open. Notably, a few recent studies have implicitly supported this idea (Liu et al., 2018; van den Ende and van Marrewijk, 2019).

3 METHODOLOGY

3.1 Research strategy

The dominant philosophy of science guiding this research is critical realism. In terms of ontology and epistemology, critical realism can be situated somewhere between the extremes (Morgan and Smircich, 1980) of objectivism (positivist, deductive, and empiricist) and subjectivism (social constructionist, inductive, and interpretive) (O'Mahoney and Vincent, 2014). Critical realism acknowledges that all reflections made by human beings are mediated by individual (e.g., a subjective belief or opinion) and social or inter-subjective (e.g., an accepted theory, perspective or, social norm) factors (Fleetwood, 2005). In this way, critical realism accepts the more subjectivist viewpoint that there is no unmediated access to the world. However, departing from pure subjectivism, according to critical realism, there are different modes of reality, including materially, ideally, artefactually, and socially real entities (Fleetwood, 2005). Miller and Tsang (2011, p. 144) describe knowledge and knowing in critical realism as follows: "A critical realist perspective affirms the possibility of truthful knowing but acknowledges that human limitations undermine claims to indubitable or objective knowledge."

The viewpoint of the temporary organization emphasizes the viewpoints of individuals, teams, and individual actors (Bakker, 2010; Packendorff, 1995). To address these viewpoints and to acknowledge the different modes of reality and the subjectivist aspects of critical realism, social informants (project actors or media discourse, depending on the article) with firsthand experience of the temporary organizations studied were utilized in this research.

Overall, this dissertation employs a sequential research strategy taking qualitative research approaches. The five sequential sub-studies (i.e., the articles of the dissertation) focus on different aspects of managing temporary organizations (i.e., control, coordination and integration, and stakeholder influences). The sequential sub-studies took place relatively separately and this introduction combines the findings of the five sub-studies. The timeline of the sequential research design is illustrated in Figure 5.

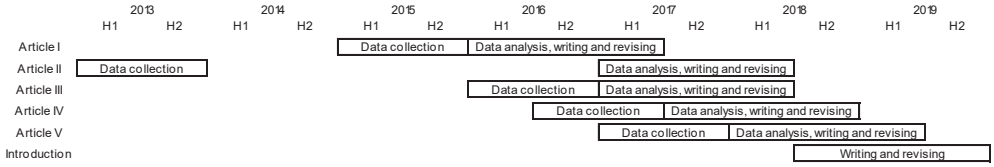

Figure 5. The sequential research design of the dissertation.

The five articles followed qualitative case study research strategies. Qualitative case studies are considered especially suitable for investigating "how" types of research questions, for studying phenomena in their real-life context, and for studying phenomena in which the boundaries between the phenomena and their contexts are fuzzy (Yin, 2014). The embeddedness and interplay of the temporary organizations in and with their external contexts (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003) justify the use of a case study research approach.

3.2 Research context

Two of this dissertation's articles (Articles I and III) were single-case studies, one (Article V) was an embedded single-case study, and two (Articles II and IV) were multiple-case studies. The research designs of the five articles are summarized in Table 9.

Table 9. Research designs of the articles.

	Article I	Article II	Article III	Article IV	Article V
Research strategy	A holistic single-case study.	A two-case study.	A holistic single-case study.	A three-case study.	An embedded single-case study.
Focus of attention	Control practices in the case project.	Integration practices in the case programs.	Change management and improvisation actions as responses to changes in the case project.	Stakeholder influence strategies in the case projects.	Coordination practices in project-based activities of the case company.
Cases	A transport infrastructure project (a road tunnel).	Two organizational change programs.	A system delivery project.	Three transport infrastructure projects (a road tunnel, a subway extension, and a railway).	Maintenance projects for complex systems.
Case context	A public–private setting (an alliance contract).	A municipality and an expert service firm.	A medium-sized engineering company.	A public–private setting (traditional procurement and an alliance contract).	Five maintenance centers of a large engineering company.
Assumptions about value creation	The value oriented goals of an infrastructure project are multidimensional. To encourage desirable action, control is targeted at different dimensions of value.	Integration is used to align program goals with the needs of the parent organization, and to prevent loss of value during program implementation.	Changes are events where the creation of value is endangered. Project actors' response actions are ways to prevent these losses of value.	Stakeholders pursue influence on projects through influence strategies. Stakeholders' value perceptions drive their influence efforts.	Inadequate project team coordination can cause losses of value. Parent organization can create beneficial circumstances for better project team coordination to prevent these losses.

Regarding the context, all articles focused on temporary organizations. Due to the three focus areas of this research — control, coordination and integration, and the

stakeholder viewpoint — different types of temporary organizations were studied. Regarding control (Articles I and III), delivery projects with explicit controller—controllee relationships were selected. To study coordination and integration, temporary organizations had to have significant organizational interdependencies. That is why multi-project settings (a multi-project change program in Article II and project business with multiple projects and project teams in Article V) were selected. Finally, stakeholder influences are especially relevant in temporary organizations which have long-lasting effects on a wide range of stakeholders. That is why public infrastructure projects were selected as the context of Articles I and IV.

In Articles I, III, and IV, the focus was on single projects; in Article II, the focus was on multi-project programs; and in Article V, the focus was on project business/project-based activities. The articles focused on transport infrastructure projects (Articles I and IV), organizational change programs (Article II), and the engineering industry (delivery project in Article III and maintenance projects in Article V). The articles focused on private sector (Articles II, III, and V), public sector (Article II), and public–private collaboration (Articles I and IV).

In the single-case studies, the justification for the single-case study design was the critical (Article I) or representative (Article III) nature (Yin, 2014) of the case projects (Creswell, 2014; Silverman, 2005). In Article I, many of the case project's characteristics (e.g., location next to a city center and a large body of water) made sustainability highly relevant. In Article III, the project supplier was a typical engineering company that delivers systems for industrial customers. The case project was a typical (representative) project delivered by that typical engineering company.

In the embedded single-case study (Article V), the focus of the case study was on the project business (especially maintenance projects) of an engineering company. The subunits of the embedded case study (Yin, 2014) were the service centers that implement the maintenance projects.

In the multiple-case studies (Articles II and IV), literal replication (Yin, 2014) was the main logic behind selecting the cases. However, some contextual differences were sought out as well in order to enable cross-case comparison (theoretical replication; Yin, 2014). Several theory-based criteria were defined when selecting the cases (Silverman, 2005). In Article II, the selected cases had to be multi-project programs with a focus on organizational change. The selected programs had to have either been completed or almost completed and had to have achieved their expected benefits (i.e., they had to be successful from the perspectives of the case informants). In Article IV, one project type (transport infrastructure projects) was chosen to ensure sufficient similarity between the projects. The selected case projects had to

alter their surroundings in various ways, be financially significant (i.e., large/major projects), and deliver infrastructure that was expected to create long-term value (i.e., make project value a relevant viewpoint). In Article IV, newspaper articles were used as the research data. This created two additional criteria for selecting the case projects: the projects should have already been completed or almost completed, and there should have been an active discussion about the projects in the media.

3.3 Data collection

Two main sources of primary research data were utilized in the articles: interview data (Articles I, II, III, and V) and newspaper articles (Articles I and IV). Project documentation was used as secondary data in all articles. The data collection and data analyses are summarized in Table 10 and discussed in more detail below.

Table 10. Data collection and data analysis.

	Article I	Article II	Article III	Article IV	Article V
Primary data	350 newspaper articles and five semi-structured interviews.	15 (8+7) semi-structured interviews.	17 semi-structured interviews.	336 (62+32+242) newspaper articles.	25 (3+7+5+5+5) semi-structured interviews.
Secondary data	Project/program documentation (project plans and reviews, etc.).				Implementation plans and reports.
Data analysis	Qualitative content analysis; two coding rounds.	Qualitative content analysis; two coding rounds.	Qualitative content analysis.	Event-oriented qualitative content analysis.	Qualitative content analysis.

All of the interview-based articles (Articles I, II, III, and V) followed qualitative case study research strategies. Interviews are commonly used to collect data in qualitative case studies (Yin, 2014). Semi-structured interviews were conducted and the interviews were recorded and transcribed by an external company. The semi-structured nature of the interview questions relied on a predefined interview protocol, but this also allowed the interviewer to exercise some freedom in order to gather more detailed information from the interviewees (Barribal and While, 1994). For all of the articles, interviewees from a variety of roles or backgrounds were interviewed (Gorden, 1987). Semi-structured interviews enabled the slight alteration of questions to suit interviewees' different backgrounds (Barribal and While, 1994).

Newspaper data were utilized for Articles I and IV. Common to these articles was that the case projects were procured by public sector organizations and the case projects were highly and publicly visible, including in the media. This enabled the case projects to be studied based on the discussions presented in newspapers. Archival data, such as newspaper articles, are particularly suitable for studying longitudinal event chronologies (Langley et al., 2013). This was the case in both articles. Newspaper data have been used in project business research as well (Ruuska

et al., 2011). However, newspaper data create some methodological limitations. These are discussed in more detail in the respective articles.

For Article I, two sets of research data were collected. The project had been actively discussed in the leading local newspaper and to a lesser extent in the leading national newspaper. This enabled the utilization of newspaper articles (350 articles in total) as research data. Because the newspapers did not have access to the internal dynamics of the project, interviews with the project personnel were conducted as well. The newspaper data that were collected and analyzed were utilized in developing the interview outline. Five one-to-one interviews were conducted following a semi-structured interview approach. The interviewees were identified by a key informant (Gorden, 1987, p. 169) and they included representatives of the contractor, the city, and the governmental transportation agency (i.e., the customer). The complementary secondary data included material collected from the project's website, particularly a project plan and a value-for-money report.

For Articles II, III, and V, interview data were collected. A semi-structured interview approach was followed and a key informant (Gorden, 1987, p. 169) assisted in identifying the interviewees. For Article V, the key informant identified informants from the five service centers who then identified the interviewees in the respective service centers. All the interviews were conducted one-to-one, and the informants were interviewed as well. For Article V, the interviews were conducted remotely via Skype. For Articles II and III, the secondary data included program/project documentation. For Article V, the secondary data included plans and reports of the implemented management framework.

For Article IV, the primary data used were newspaper articles. The article followed a process research method (Langley et al., 2013), which made document-based data collection suitable. The collected dataset included 1293 newspaper articles collected from two newspapers. Secondary data were collected from three sources: the projects' own websites, the ministry of transport website, and the local cities' web archives. The secondary data included project plans and project reviews.

3.4 Data analysis

In all the articles, a qualitative content analysis approach to the data analysis was followed (Hsieh and Shannon, 2005). In addition, Article IV took a qualitative event-oriented approach to the data analysis (Morgeson et al., 2015). In the literature, the term "content analysis" is used quite vaguely at times. In this dissertation, content

analysis refers to the systematic classification process of coding and categorization (Hsieh and Shannon, 2005). According to Hsieh and Shannon (2005), there are three general approaches to qualitative content analysis: conventional, directed, and summative content analysis. For this dissertation, the relevant approaches were the conventional and the directed approaches, with the main difference between the two being the use of the existing literature in the coding framework (more inductive vs. more deductive) (Hsieh and Shannon, 2005). The data analysis was mostly inductive (i.e., the conventional approach) in all five articles, but especially in Article IV where the prior literature played a strong role in data analysis as well.

In Article I, qualitative content analysis was used for both data sets, but the analysis took place in two rounds. Evidence of sustainability-related actions in the projects was sought in the first round of analysis. This round of coding focused on the newspaper articles. Before coding the newspaper articles, the irrelevant articles were excluded. A newspaper article was considered relevant only if it focused directly on the project and did not only mention it in passing. This process reduced the number of articles from 350 (the original dataset) to 76 (the number of relevant articles in the final dataset). In the second coding round, the interview data were analyzed with a focus on the control practices targeting sustainability. In both coding rounds, the analysis took place inductively. However, earlier literature was utilized in developing the coding frameworks (the three dimensions of sustainability were used in both coding rounds; the concepts of a controller, a controllee, and control mechanisms were used in the second coding round).

In Article II, qualitative content analysis was used for analyzing the interview data. The analysis took place in two coding rounds. In the first round, the focus was on the integration mechanisms utilized and the two integration interfaces (project-to-project and program-to-parent). The inductively identified integration mechanisms were categorized under five integration tasks. At this point, the preliminary results were recorded. From the preliminary results, the potentially interesting concept of agency in the practice of integration was identified. A second coding round was performed with a focus on the different program actors and their agency in integration. In both coding rounds, the analysis took place inductively. However, earlier literature was utilized in developing the coding frameworks (the concept of an integration mechanism and the two integration interfaces in multi-project programs were used in both coding rounds; the concept of agency was used in the second coding round).

Qualitative content analysis was utilized similarly in Articles III and V. The analysis began by coding all the relevant quotations in the interview transcripts (i.e.,

an open coding strategy). For instance, in Article V, a quotation was considered relevant if it discussed a perceived benefit of or challenge to the new way of working, a characteristic of the old way of working, or a perceived difference between the two. In the second phase, similar codes were merged and renamed. For instance, in Article III, the open codes were re-coded according to the types of changes, the reasons for the changes, and the different types of response actions taken by the project personnel. In the final phase, an inductive categorization of the findings was conducted. For instance, in Article III, the result of the final coding phase was the identification of four change management patterns/response actions.

As in Article I, the first step in the data analysis in Article IV was narrowing down the dataset. Of the 1293 newspaper articles in the original dataset, 746 articles turned out to be relevant and 336 articles were relevant to stakeholder influences (i.e., the final dataset). An article was included in the original dataset if the project name appeared anywhere in the full text of the article. However, an article was considered relevant only if it focused on the project, not if the project was simply mentioned in passing and the true focus of the article was something else. This explains the large difference in the numbers of articles in the original dataset and the final dataset.

Once the relevant articles had been identified, the data analysis was conducted using a qualitative content analysis combined with a qualitative event-oriented approach (Morgeson et al., 2015). Article IV focused on stakeholder influences on infrastructure projects, and the efforts to influence were conceptualized as events. The event-oriented approach highlighted the possible interconnections between the events and the stakeholders' actions. In addition to the event structure, three viewpoints were coded using content analysis: the active stakeholders (i.e., who was doing the influencing or being influenced?), the influence strategies utilized (i.e., how was influence pursued?), and the related dimensions of project value (e.g., how was an effort to influence justified by project value?). Earlier literature was utilized to develop the coding framework in terms of the potential stakeholder influence strategies and the potential dimensions of project value. Despite the preliminary coding framework, the coding took place inductively, and the final coding framework was relatively different.

Several methodological issues affected the validity and reliability of the empirical findings in this research. The article-specific considerations are included in the respective articles, and a more general overview of validity and reliability is presented in section 6.3.

4 FINDINGS

4.1 Sustainable project management through project control in infrastructure projects

4.1.1 Rationale and positioning

Sustainability is an important dimension of project value. This applies both to the project implementation phase (i.e., the sustainability of the project delivery) and the use phase (i.e., the sustainability of the project deliverables). While there are numerous definitions of sustainability (Aarseth et al., 2017), most scholars agree on the viewpoint of the triple bottom line (Silvius and Schipper, 2014). In other words, sustainability balances the economic, environmental, and social dimensions of value.

The previous research on sustainable project management has focused mostly on the design and planning phases (i.e., the project front end). In Article I, it was proposed that actions promoting project sustainability take place in the project implementation phase as well, but the control of sustainability in the implementation phase is not yet sufficiently understood. The focus of Article I was on the three dimensions of sustainability, especially during the project implementation phase of an infrastructure project. This idea was addressed from the viewpoint of project control. The following research questions were formulated:

1. How does the project organization implement the three dimensions of sustainability?
2. How does the project organization use project control for sustainable project management?

Regarding this dissertation, Article I focuses on the relationships between control and value. The article follows the control package viewpoint of control and highlights how different control mechanisms target different dimensions of value.

4.1.2 A control package for promoting project sustainability

The findings of Article I highlighted the sustainability related actions in the project and the control practices promoting sustainability. Examples of the sustainability-related actions include cost savings (economic value), dust and noise reductions (environmental value), and communication directed toward the general public (social value).

Regarding control practices, the article conceptualized project control as a control package. Five control mechanisms were identified: alliance model, project planning, measurements and indicators, regulations, and external communication. The five control mechanisms were used in different ways with respect to the three dimensions of sustainability (Figure 6).

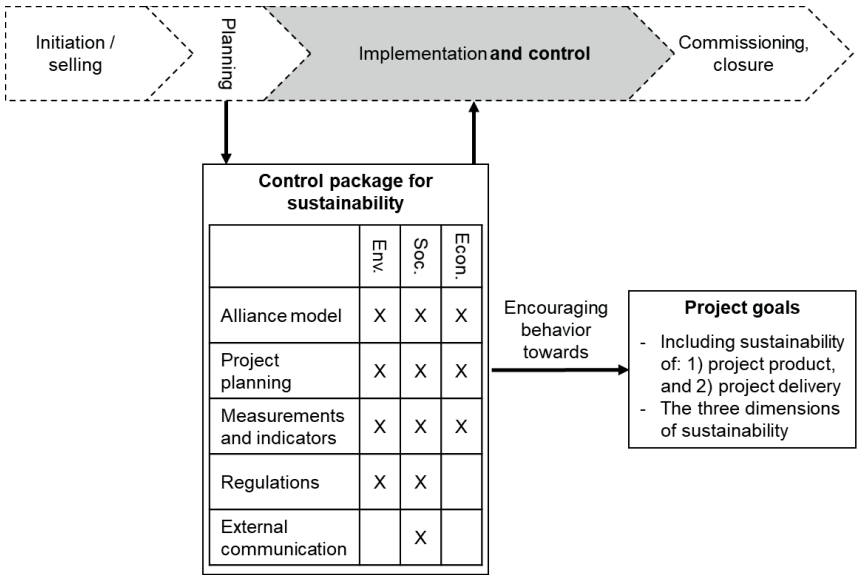

Figure 6. A control package promoting sustainability in an infrastructure project (Article I).

The alliance model was a contract model between the customer and the main contractor. The alliance model included a financial incentive model and various performance indicators, all of which included financial bonuses and sanctions. All three dimensions of sustainability were included to some extent in the alliance model.

The alliance model encouraged project planning in a collaborative way between the customer and the main contractor. The interviewees described how, due to collaborative project planning, sustainability became a built-in element of daily project work in the project implementation phase.

Due to the public nature of the project, various regulations set by the respective public sector authorities affected the project as well. Most of the regulations were rules and limitations (including measurements and indicators) set to prevent environmental or social disturbance or damage.

Finally, the evaluation of the public image of the project was included in the incentive model of the alliance model. This encouraged the main contractor to invest more in external communication, including appointing a person responsible for addressing stakeholders' worries and inquiries, for example.

4.1.3 Contribution of Article I

Article I highlighted the dependencies between the three dimensions of sustainability. These dependencies have been acknowledged in previous studies (Silvius and Schipper, 2014), but this article contributes to the earlier literature by demonstrating how the alliance model fostered this balance. The article emphasized the role of the social dimension of sustainability as well. The social dimension is underexplored in the previous literature (Edum-Fotwe and Price, 2009).

The article conceptualized project control as a package of control mechanisms. This conceptualization is widely acknowledged in the project control literature (see section 2.2). However, the literature on project sustainability has focused mostly on the role of performance indicators in promoting and ensuring sustainability (Boz and El-adaway, 2015; Fernández-Sánchez and Rodríguez-López, 2010; Hwang and Tan, 2012; Klakegg, 2009; Shen et al., 2011). This article demonstrated a wider range of control mechanisms promoting project sustainability.

The article contributes to the value creation literature by proposing a link between control and the delivery of value. In terms of traditional success measures, the case project was delivered under budget and ahead of schedule with little scope alterations, so it can be considered successful. However, the control package targeted other dimensions of value as well, in this case the three dimensions of sustainability. For instance, the control package encouraged the project actors to focus on the public image of the project, and to pay special attention to safety or environmental aspects. This way, the findings of Article I illustrate how control can be used to promote the achievement of multidimensional value-oriented project goals, in addition to the traditional iron triangle objectives.

There were also control mechanisms originating both outside (external) and within (internal) the project. The importance of external control differentiates this

article from the majority of the project control literature, in which the dominant theme is control between a project manager and project team members. From the perspective of value creation, the different sources of control illustrate the subjective nature of value and the issue of various stakeholders with different value perceptions.

4.2 Program integration in multi-project change programs: Agency in integration practice

4.2.1 Rationale and positioning

One key challenge in program management is managing the interdependencies between the parent organization and a multi-project program and those between the projects of a program. To ensure that different subsystems work as a coherent, aligned unit, integration is required. Although there is a strong stream of literature on integration in permanent organizations (e.g., Lawrence and Lorsch, 1967), significantly fewer studies have analyzed integration in temporary organizations, especially in multi-project programs (Dietrich, 2006; Lehtonen and Martinsuo, 2009; Turkulainen et al., 2015). In Article II, the term "program integration" referred to integration in multi-project programs.

Dietrich (2006) studied the integration of program projects and Lehtonen and Martinsuo (2009) focused on the interface between a program and a parent organization. Only Turkulainen et al. (2015) have studied integration in both interfaces (project-to-project and program-to-parent). Article II was positioned to contribute to the earlier literature by taking into account both integration interfaces. In addition, the perspective of agency (Näsänen and Vanharanta, 2016) was utilized when analyzing the practice of integration in the case programs. The main argument was that it is not sufficient to limit the analyses to the utilized integration mechanisms. It is also important to understand how the different program actors utilize those integration mechanisms. Therefore, the following research questions were formulated:

1. What kind of integration mechanisms do program actors use in program-to-parent organization integration and project-to-project integration in organizational change programs?
2. How do program actors exercise their agency in program integration?

In terms of this dissertation, Article II focuses on two organizational interfaces: the program-to-parent organization interface and the project-to-project interface. Integration is proposed as a means to manage value creation at these two interfaces.

4.2.2 Integration tasks and agency in integration

Article II studied integration in two organizational change programs. Five integration tasks were identified: 1) the creation and communication of a change vision; 2) the supervision of a program's progress; 3) the exchange of information in the program–parent interface; 4) the coordination of the multi-project program; and 5) the coordination and support of the individual project manager. Integration tasks (i.e., the purposes or goals of integration) provide a bridge between the utilized integration mechanisms and the goals of an organizational change program. The five integration tasks were grouped under the two integration interfaces in multi-project programs. Figure 7 illustrates the hierarchy of integration mechanisms, integration tasks, and integration interfaces.

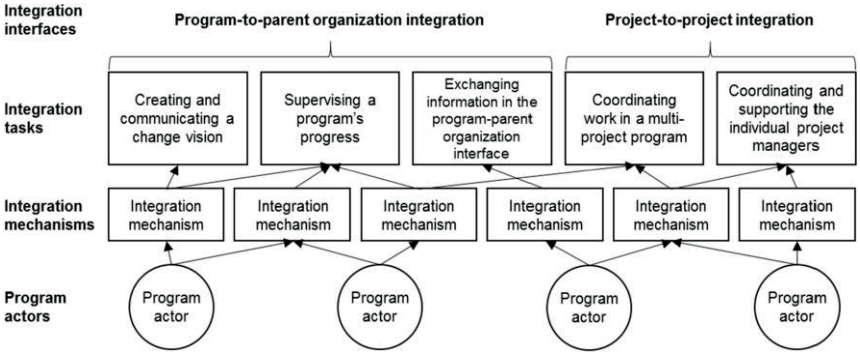

Figure 7. Integration mechanisms, integration tasks, and integration interfaces (Article II).

In addition to the five integration tasks, several integration mechanisms were identified. The most heavily emphasized examples included program office meetings, management group meetings and workshops, and one-to-one discussions between project managers and between project managers and program managers. Regarding the integration modes, most of the integration mechanisms were in the personal or group mode; few impersonal integration mechanisms were identified.

A key aspect of Figure 7 is that program actors utilize the same integration mechanisms for various purposes (i.e., toward various integration tasks). For

instance, program office meetings were utilized in the "creating and communicating a change vision," "supervising a program's progress," and "coordinating work in the multi-project program" integration tasks.

Finally, the concept of agency relates to the ways in which program actors utilize integration mechanisms and participate in integration tasks. The analyzed program actors included the parent organization, the program-level and project-level steering groups, the program manager, the project managers, and the employees. When comparing the two case programs, several relevant agency phenomena arose, as summarized in Figure 8.

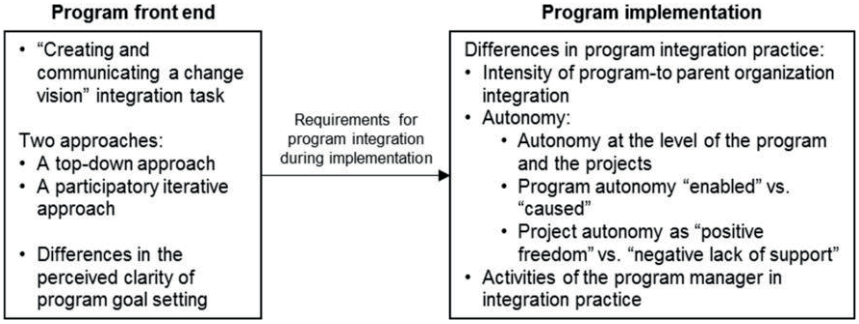

Figure 8. Integration mechanisms, integration tasks, and integration interfaces (Article II).

Figure 8 illustrates how the practice of integration at the program front end sets requirements for integration in the implementation phase. There can be variance in the intensity of integration in the program–parent integration interface and in the program actors' autonomy at different levels of the program. Finally, the program manager, as a key program actor, can take different integration actions.

4.2.3 Contribution of Article II

The majority of the previous literature on integration has focused on the integration mechanisms utilized in different contexts. Although strongly linked to integration mechanisms, this article contributed to the existing literature by proposing the concept of an integration task and by highlighting program actors' agency in pursuing integration. Regarding the integration task, the concept bridges integration mechanisms and the integration interfaces. This linkage answers the question: "Why are these integration mechanisms used in this integration interface?"

With the agency viewpoint, this article shed light on the agency of program actors in pursuing program integration and on the different nature of program integration in the program front-end phase and in the program implementation phase. The agency viewpoint links this article to discussions on the program front end (Lehtonen and Martinsuo, 2008; Martinsuo and Lehtonen, 2007; Thiry, 2002), program and project actors' autonomy (Gemünden et al., 2005; Hoegl and Parboteeah, 2006; Martinsuo et al., 2010), and program management competence (Miterev et al., 2016), for example.

Regarding value creation, this article proposes integration as a means to manage value creation in an embedded temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003). Especially at the interface between the temporary organization and the permanent organization, the viewpoint of value creation relates to aligning program goals with the requirements of the parent organization. In other words, integration is a means to ensure that the outcomes of the program are valuable or beneficial to the parent organization. There is a clear resemblance with benefits management, especially setting target benefits (e.g., Zwikael et al., 2018), here. Within the temporary organization, integration is used both to ensure goal alignment (e.g., by clarifying and re-defining goals) and to prevent loss of value (e.g., by solving problems and avoiding schedule problems or delays).

The concept of an integration task proposes that there is a distinction between coordination and integration as well. Coordination and integration are often used almost interchangeably in the literature (Dietrich, 2007). According to the findings of this study, integration is more focused on vertical (i.e., program-to-parent) interdependencies, while the focus of coordination is more on horizontal (i.e., project-to-project) interdependencies. However, the distinction between the two concepts seems to be highly context-dependent.

4.3 Lifecycle view of managing different changes in projects

4.3.1 Rationale and positioning

Project contractors' typical methods of ensuring the fluent progress of their delivery projects include planning the projects well and following a project management methodology (PMM) (Lehtonen and Martinsuo, 2006). However, despite thorough planning and the utilization of a PMM, various changes do typically take place in

projects (Klein et al., 2015). Article III focused on two different types of changes and their related response actions, changes to project plans and change management actions, and deviations from the PMM and improvisational actions.

There are relatively strong streams of literature both on change management in projects and on improvisation in general. However, the two types of changes and their related response actions have mostly been covered separately. Moreover, there is a need to understand changes and change management over the project lifecycle (Dvir and Lechler, 2004; Zhang, 2013) and improvisation not just in general but especially in projects (Leybourne and Kennedy, 2015). This article was positioned to address these research gaps by taking into account both types of changes and related response actions and by focusing on the whole lifecycle of a delivery project. The following research questions were formulated:

1. What kinds of changes do project personnel experience during the project lifecycle including: a) changes to the project plan; and b) deviations from the PMM, and what are the origins of the changes?
2. How do project personnel and managers implement change management and improvisation actions in the different phases of the project lifecycle?

For this dissertation, the key findings of Article III are the two types of changes and the respective corrective actions. In terms of value creation, the different changes are events in which value can be lost. By performing corrective actions, the potential losses of value can be prevented.

4.3.2 Change management and improvisation throughout the project lifecycle

Article III revealed the different changes (changes to plans and deviations from a PMM) occurring over the project lifecycle. The project lifecycle was divided into the pre-project phases, the engineering, manufacturing, and procurement phases, and the installation and implementation phases. For each identified change, the article mapped the internal (i.e., the reason(s) for the change originated within the project contractor) and external (i.e., the reason(s) for the change originated outside the project contractor) reasons for it. The article also categorized the respective change management and improvisational actions.

When analyzing the different types of changes, evidence of interconnected changes and the respective change management and improvisational actions was

identified. Regarding the change management and improvisational actions, different actions were performed by different project personnel. Project managers mainly performed change management actions while assembly workers mainly performed improvisational actions, for example. The different change management and improvisational actions are illustrated in Table 11.

Table 11. Examples of change management and improvisational actions performed by different project personnel (Article III).

	Change management actions	Improvisational actions
Project managers	- Schedule modifications. - Negotiations with the customer related to the changing requirements and their fulfillment. - Work design tactics.	
Planners and manufacturing employees	- Work design tactics (e.g., overtime and altered work instructions) to make up for schedule delays.	- Improvisational work and instruction of improvisational work to meet difficult or incompatible customer requirements.
Middle managers, work supervisors	- Work design tactics (e.g., overtime and altered work instructions) to make up for schedule delays.	- New ways of managing the work of less experienced employees.
Assembly		- Improvisational work and instruction of improvisational work to adapt to challenging situations in the installation and implementation phases. - Improvisational work to achieve an optimally functioning system in the installation and implementation phases.

4.3.3 Contribution of Article III

This article contributed to the earlier literature by combining two types of changes — changes to plans and deviations from a PMM — that are most often studied separately. The article studied changes and change management throughout the project lifecycle (Dvir and Lechler, 2004; Zhang, 2013) and provided a better understanding of improvisation in projects (Leybourne, 2006; Leybourne and Sadler-Smith, 2006), particularly in delivery projects (Leybourne and Kennedy, 2015).

When a project does not progress according to plan, response actions are required. Article III demonstrated two types of response actions (change management and improvisation) and two types of reasons (external and internal) for changes and their consequent response actions. As illustrated in Table 11, different response actions were performed by different project personnel.

Regarding value creation, response actions (change management, and improvisation) can be seen as actions taken by the project actors to prevent the loss of value. In other words, changes are events where the desired progress of the project is endangered and value can be lost. By performing response actions, project personnel try to prevent these potential losses of value. For example, the work design

tactics followed by the middle managers and work supervisors can be seen as means to prevent unnecessary delays (i.e., losses of value).

4.4 Value-oriented stakeholder influence on infrastructure projects

4.4.1 Rationale and positioning

Stakeholder management is a central aspect of project management and both the practitioner guidelines and the scientific discussion (Littau et al., 2010; Mok et al., 2015) have paid significant attention to it. The earlier literature has tended to focus more on the viewpoint of the project or the focal firm (Aaltonen and Kujala, 2010; Littau et al., 2010; Mok et al., 2015) than the perspective of the stakeholders themselves. In other words, the focus has been mostly on the ways that stakeholders are managed. Article IV took the opposite perspective by studying the viewpoint of the stakeholders themselves.

A central concept for understanding the stakeholders' viewpoint is stakeholder influence. The previous literature has identified the stakeholder influence strategies with which stakeholders aim to influence the decisions of the focal firm directly or indirectly (Aaltonen et al., 2008; Aaltonen and Kujala, 2010; Frooman, 1999). However, the previous literature has provided few reasons for the stakeholders' influence efforts. In this article, the main argument was that stakeholders' perceptions of project value drive their efforts to influence. The following research questions were formulated:

1. What kinds of influence strategies do stakeholders utilize in infrastructure projects to achieve their goals?
2. How do stakeholders' expectations and requirements for project value drive their attempts to influence?

Article IV contributes to this dissertation by proposing a linkage between perceived value and stakeholder influence efforts. In other words, the findings of this article highlight stakeholders' perceptions of value as reasons for their attempts to influence projects.

4.4.2 Project value driving stakeholder influence

Article IV discovered four types of stakeholder influence strategies that are utilized by stakeholders. The influence strategies are summarized in Table 12.

Table 12. The four types of stakeholder influence strategies (Article IV).

Influence strategy	Definition	Examples
Communicating	Stakeholders utilize media to reach a wider audience for their claims.	- Opinion pieces written by residents or experts, business representatives, etc. - Journalists discussing the projects in editorials and news analyses.
Complaining and resolving disputes	Stakeholders oppose a project's plans or actions formally or informally. The opposition can lead to formal appeals and legal decisions.	- Residents complaining about a project's plans or actions. - Residents lodging appeals and formal complaints. - Disputes with contractors, suppliers, etc. - Stakeholders threatening each other with legal action. - Litigation and court decisions.
Setting rules and supervising the project	Stakeholders set rules and supervise the project work or the project deliverables.	- Cities and other authorities set rules for and limitations on the project work (e.g., time restrictions on performing noisy work). - Authorities supervise the project deliverables; for example, safety requirements.
Using decision-making authority	Stakeholders use their decision-making authority.	- Powerful stakeholders make independent decisions. - Independent decisions made by the cities. - Decisions of the cities or the transport authorities on public transport timetables, routes, etc. - Funding decisions by the government.

In addition to the four types of stakeholder influence strategies, the dimensions of project value driving stakeholders' influence efforts were mapped. Project value was divided into three dimensions: environmental and social value, financial value, and systemic value.

Regarding environmental and social value, authorities set rules and limits for work (e.g., noise) and residents communicated their concerns about the negative environmental effects of the projects, for example. Regarding financial value, there were disputes about the costs of additional work and occasions where stakeholders (especially politicians) demanded explanations for uncertain or increased project costs, for example. Systemic value refers to value linkages between a project and other projects, or between a project and its surroundings. An illustrative example of systemic value driving stakeholders' influence efforts was stakeholders' opposition to changes to the existing public transport network (e.g., bus timetables).

Finally, the stakeholder influence strategies and the project value dimensions were cross-tabulated. This analysis revealed dominant patterns of specific stakeholder influence strategies driven by specific project value dimensions. These patterns are illustrated in Table 13.

Table 13. Stakeholder influence strategies driven by different project value dimensions (Article IV).

	Communicating	Complaining and resolving disputes	Setting rules and supervising the project	Using decision-making authority
Environmental and social value	Importance*: high	Importance: low	Importance: high	Importance: low
Financial value	Importance: low	Importance: high	Importance: low	Importance: high
Systemic value	Importance: medium	Importance: low	Importance: low	Importance: medium

** Importance refers to the relative dominance of a specific influence strategy for influence efforts driven by the specific value dimension.*

4.4.3 Contribution of Article IV

Article IV contributed to the existing literature by creating a better understanding of the viewpoint of the stakeholders themselves instead of limiting the research to the viewpoint of the project or the focal firm, as is common in the previous literature (Aaltonen and Kujala, 2010; Laplume et al., 2008; Mok et al., 2015).

The article identified four stakeholder influence strategies that are especially relevant in public transport infrastructure projects with long value horizons. Two of the influence strategies, "communicating" and "complaining and resolving disputes," are also evident in the earlier literature (Aaltonen et al., 2008; Aaltonen and Kujala, 2010), but the other two, "setting rules and supervising the project" and "using decision-making authority," seem to be specific to this context.

The main contribution of this article to this dissertation is the link it makes between perceived value and stakeholder influence. The previous literature has provided few reasons for stakeholders' influence efforts. Article IV contributes to filling this research gap by proposing a framework of project value dimensions driving stakeholder influence (Table 13). The findings of this article and the proposed framework are implicitly supported by a few recent empirical studies (Liu et al., 2018; van den Ende and van Marrewijk, 2019). Therefore, this article builds a bridge between the literature on project value and stakeholder management.

4.5 Promoting project team coordination in repetitive projects

4.5.1 Rationale and positioning

Teamwork is an established form of work in all organizations, including projects (Chiocchio and Hobbs, 2014) and temporary organizations in general (Bakker, 2010).

Although beneficial in various ways, the division of work between teams and between team members creates interdependencies (Hoegl et al., 2004). These interdependencies, combined with the changes occurring throughout a project, create a need for project team coordination (Galbraith, 1973; Hoegl et al., 2004).

Most of the previous literature on project team coordination has focused on large and/or innovative projects. Article V focused on the opposite context — small and repetitive maintenance projects — to which the findings of the earlier literature might not apply (Hoegl et al., 2003). Regarding the unit of analysis, most of the previous literature has studied project team coordination at the project or project team level. In this article, the interest was on how a parent organization can promote or create supportive circumstances for better project team coordination in its project-based activities. The main argument was that a parent organization can introduce new ways of working (i.e., a PMM) that have a positive effect on the project-based activities (e.g., improved coordination). The following research question was formulated:

1. How can standardized ways of working, introduced by a parent organization, promote project team coordination in repetitive projects?

Regarding value creation, Article V highlights the parent organization's possibilities for creating beneficial circumstances for improved project team coordination. Improved project team coordination is, in turn, seen as beneficial for avoiding losses of value in temporary organizations.

4.5.2 A PMM as an enabler of improved project team coordination

Article V focused on an engineering company (i.e., the parent organization) that introduced a management framework (i.e., a PMM) to its service centers. The service centers are responsible for maintaining the systems (or components or modules of the systems) delivered by the parent organization. These maintenance tasks are organized as maintenance projects.

The findings of this article identified a variety of challenges in the old ways of working in the maintenance projects. The interviewees perceived a positive change after the introduction of the new PMM in terms of team communication, availability of project information, and decision-making. These were all considered elements of improved project team coordination. Figure 9 summarizes the earlier challenges and the perceived changes after introducing the new PMM.

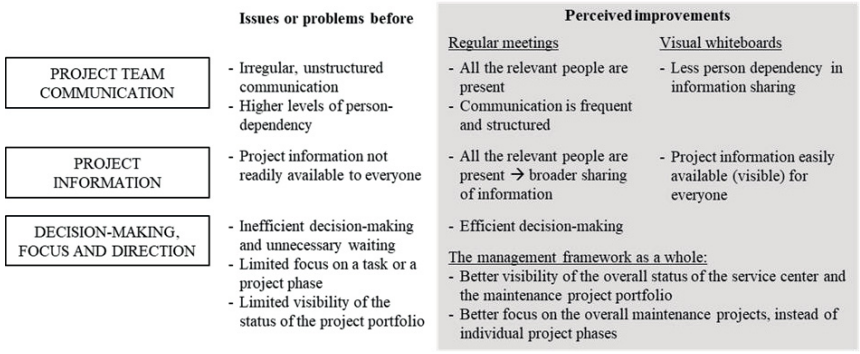

Figure 9. Earlier challenges and perceived changes after introducing the new PMM.

4.5.3 Contribution of Article V

This article contributed to the calls for additional research on coordination in temporary organizations (Bechky, 2006; Faraj and Xiao, 2006). In particular, this article created a better understanding of coordination in a different context (smaller, less innovative projects) and focused on a different unit of analysis (the parent organization) than the majority of the earlier literature.

The findings of this article demonstrated how a structured management framework (a PMM) can create beneficial circumstances for improved coordination in smaller, more repetitive projects. This way, this article framed the parent organization as an active actor — not just as the context or environment of the temporary organization. Earlier studies have discussed the active role of the parent organization from the perspectives of integration (Lehtonen and Martinsuo, 2008; Turkulainen et al., 2015), project learning (Bakker et al., 2011), and project selection (Lefley, 2013), for example. This article broadens this view to include project team coordination.

Regarding value creation, the findings of this article illustrated numerous earlier problems that can be considered to indicate the loss of value (e.g., delays). The interviewees perceived that the introduction of the PMM mitigated these challenges by improving project team coordination. For instance, the interviewees explained how the regular meetings enable the project teams to react to potential problems immediately, and how the visual whiteboards mitigate the issue of person dependency. This way, project team coordination can be seen as a promoter of value creation (especially by preventing the loss of value) in temporary organizations. Through its methodological setting and the selected unit of analysis, Article V

highlights the possibilities of a parent organization to manage value creation in its temporary organizations (i.e., projects).

4.6 Management perspectives to value creation in temporary organizations: a summary of findings

The five articles of this dissertation have followed different perspectives to the management of temporary organizations: control (Article I and Article III), coordination and integration (Article II and Article V), and the stakeholder viewpoint (Article IV). Through these different viewpoints, the articles have revealed different aspects of value creation in temporary organizations. The contributions of the five articles to the management of value creation in temporary organizations are summarized in Table 14.

Table 14. Contributions of the dissertation articles to the management of value creation in temporary organizations.

Article	Contributions
Article I	- Control is a way to encourage desirable action towards organizational objectives. - When the goals of a project are considered value oriented and multidimensional, different control mechanisms can be targeted at different dimensions of value. - Article I demonstrated how a control package was targeted at the three dimensions of sustainability (i.e., economic, environmental, and social value) in an infrastructure project.
Article II	- In multi-project programs, there are two focal organizational interfaces: the interface between the parent organization and the program (i.e., program-to-parent), and the interfaces between the projects of the change program (i.e., project-to-project). - In terms of value creation, coordination and integration are required to manage value creation at the two interfaces. - Integration is mostly related to vertical interdependencies (esp. the program-to-parent interface) and the focus is mostly on ensuring that the outcomes of the program are beneficial (i.e., "of high value") for the parent organization. - Coordination is mostly related to horizontal interdependencies (esp. the project-to-project interface) and the focus is mostly on ensuring the desirable progress of the projects to avoid losses of value.
Article III	- Despite thorough planning or the utilization of a PMM, various changes do typically take place in projects. Project actors respond to changes by taking two types of response actions: change management actions and improvisational actions. - Changes jeopardize the progress of a project. In terms of value creation, changes can be seen as potential losses of value. - Consequently, response actions taken by project actors can be seen as project actors' actions to prevent the loss of value.
Article IV	- Stakeholders pursue influence on organizations by employing stakeholder influence strategies. - Little is known about the "whys" behind the stakeholders' influence efforts, especially in temporary organizations. - Article IV proposed stakeholders' value perceptions as antecedents of their influence efforts. In other words, stakeholders' value perceptions explain why stakeholders utilize specific influence strategies.
Article V	- The division of work between project teams and between project team members creates interdependencies. To manage these interdependencies, project team coordination is required. - Inadequate project team coordination can cause various problems such as unnecessary delays. In terms of value creation, these problems can be seen as potential losses of value. - Article V demonstrated how the parent organization can promote better project team coordination in its temporary organizations by introducing a structured management framework (a PMM). This way the parent organization can promote value creation, especially by preventing loss of value due to inadequate project team coordination.

5 DISCUSSION

This chapter discusses the contributions of this dissertation in light of the earlier literature. The chapter is divided into four sections. Sections 5.1 to 5.3 discuss the answers to the three research questions. Section 5.4 synthesizes the overall contributions of this dissertation to the question of managing value creation in temporary organizations.

In all articles, the studied organizations can be seen as task-oriented temporary organizations (Bakker, 2010; Lundin and Söderholm, 1995) that create multidimensional value for a variety of stakeholders. By building on the three key characteristics of value — lifecycle orientation, subjectivity, and multidimensionality — several contributions to the earlier literature have been made.

5.1 Research question 1: Encouraging desirable action

The first research question enquired: "How do actors use control to encourage desirable action?" This dissertation demonstrates how different control packages are designed for different dimensions of value, and how actors take two types of response actions — change management actions and improvisational actions — to secure desirable progress toward value-oriented goals. Articles I and III, and partially Article IV, contributed to answering this research question.

This dissertation demonstrates how the multidimensionality of value calls for different control packages. In Article I, control packages were in place for the production task of the road tunnel and for the value dimension of sustainability. In the earlier literature on control in temporary organizations, the idea of control as a control package is widely accepted[3] (e.g., Choudhury and Sabherwal, 2003; Kirsch, 1997). This dissertation complements this idea by demonstrating not only how there are different control packages in different projects but also how different control packages are used for different purposes (i.e., different dimensions of value). This

[3] In the literature on control in temporary organizations, the term "control portfolio" is used more often. However, in this dissertation, the term "control package" is used to avoid creating confusion with project portfolios.

contribution is illustrated in Figure 10. For instance, the alliance model covered all three value dimension of sustainability (environmental, economic, and social value), while regulation covered only two value dimensions (Article I).

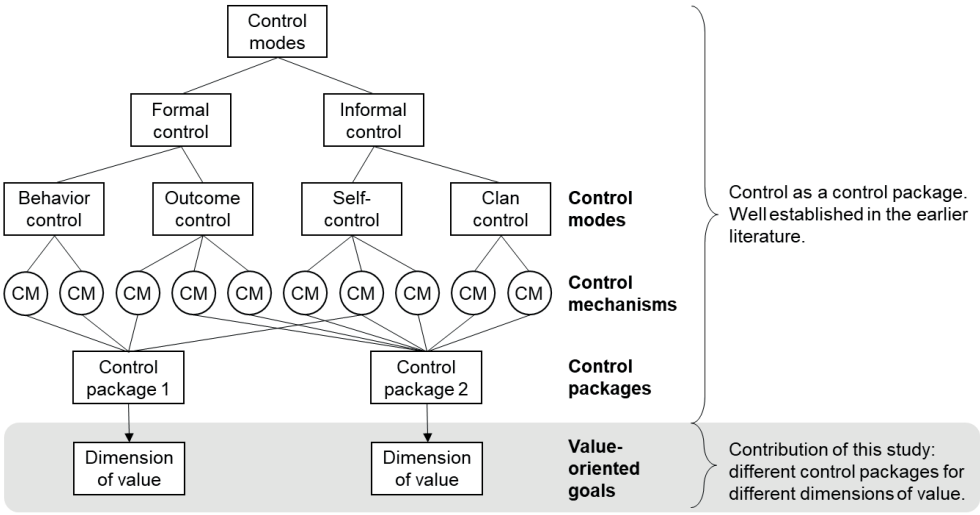

Figure 10. Different control packages encouraging desirable action for different dimensions of value.

Although labeled differently (control versus stakeholder influences), the combined findings of Article I and Article IV generalize the previous contribution further. The more general contribution states that in temporary organizations, various influence actions are taken by different actors, targeting different dimensions of value. Highlighting the embedded nature of temporary organizations (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003), these influence actions (control and stakeholder influences) are taken by both the internal actors of the temporary organization and external stakeholders. In terms of value creation, it can be stated that external and influence actors perceive value differently (i.e., subjectivity of value) and take different actions (control practices and stakeholder influence efforts) to encourage desirable action towards different dimensions of value. For the control literature, this contribution calls for widening the focus from the dyadic project manager–project team or client–vendor relationships (Heumann et al., 2015) to the broader environment in and around the temporary organization. The stakeholder theory viewpoint on this idea is discussed further in section 5.3.

The basic procedures of control include monitoring project progress against a plan, analyzing variances, and conducting corrective action as needed (PMI, 2017). This dissertation contributes to answering the question of corrective action by

describing two types of corrective actions: change management and improvisation (Article III). Again highlighting the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003), Article III discussed the internal and external reasons for changes. From the perspective of control and value creation, these changes can be seen as potential losses of value, and the two types of corrective actions can be seen as ways to prevent these losses of value.

5.2 Research question 2: Managing organizational interdependencies

The second research question enquired: "How do actors manage interdependencies a) within the temporary organization, and b) between the temporary organization and the permanent organization?" This dissertation answers to this research question by proposing coordination and integration as ways for managing value creation at two organizational interfaces, horizontal and vertical interfaces respectively. Articles II and V contributed to answering this research question. Three contributions to the earlier literature have been made.

This dissertation argues that coordination and integration are ways of promoting value creation. By managing organizational interdependencies, coordination and integration promote value creation at different organizational interfaces. In Article II, the integration tasks were ways to ensure the alignment of the program goals with the needs of the parent organization and to secure progress was made toward those goals; in other words, to promote value creation. In Article V, the implemented coordination mechanisms were perceived to mitigate problems such as delays, "hassles," and a lack of focus (i.e., potential losses of value); in other words, to promote value creation by preventing losses of value. In terms of value creation, Articles II and IV describe the management of organizational interfaces as ensuring the "worth" of a temporary organization (i.e., goal alignment) for the parent organization, and as preventing losses of value.

The terms "coordination" and "integration" are used partly interchangeably in the earlier literature (see section 2.3; also e.g., Dietrich, 2007). This dissertation proposes making a distinction between the two similar concepts based on their focus on organizational interfaces. In Article II, both elements of integration and coordination were present. The elements of integration (i.e., the respective integration tasks) focused mostly on the program–parent interface, while the elements of coordination (i.e., the integration tasks related to coordination) focused

on the project-to-project interface. Regarding Article V, the implemented coordination mechanisms focused mostly on the interface within and between project teams. Combining the findings of the two articles, it is argued that integration is more related to managing vertical (e.g., program–parent) organizational interdependencies, while coordination is more related to managing horizontal (e.g., project-to-project) interdependencies.

Finally, this dissertation presents the parent organization as an active actor and emphasizes the centrality of the temporary–permanent interface in value creation. In Article II, integration between the temporary organization and the parent organization was necessary to ensure the alignment of goals and, consequently, value creation. In Article V, improving coordination in temporary organizing was not the task of the temporary organizations, but it was achieved by the actions of the parent organization. These findings highlight the idea of a temporary organization as an agency set up by the parent organization (Turner and Müller, 2003).

5.3 Research question 3: Exerting external influence

The third research question enquired: "How do stakeholders' perceptions of value drive their influence efforts?" This dissertation answers this research question by proposing value perceptions as the drivers of stakeholder influence efforts. Article IV and partially Article I contributed to this research question.

Although stakeholder influence strategies are an established feature of the earlier literature (Aaltonen et al., 2008; Aaltonen and Kujala, 2010; Frooman, 1999), there is little focus on the "whys" behind them. The findings of Article IV demonstrate how stakeholders' perceptions of value drive their influence efforts. This idea is strongly linked to the multidimensionality of value, because influence efforts take different forms with respect to different dimensions of value. For instance, the influence strategy "communication" was mainly driven by environmental and social values, while the influence strategy "complaining and resolving disputes" was mainly driven by financial value (Article IV). This contribution is illustrated in Figure 11.

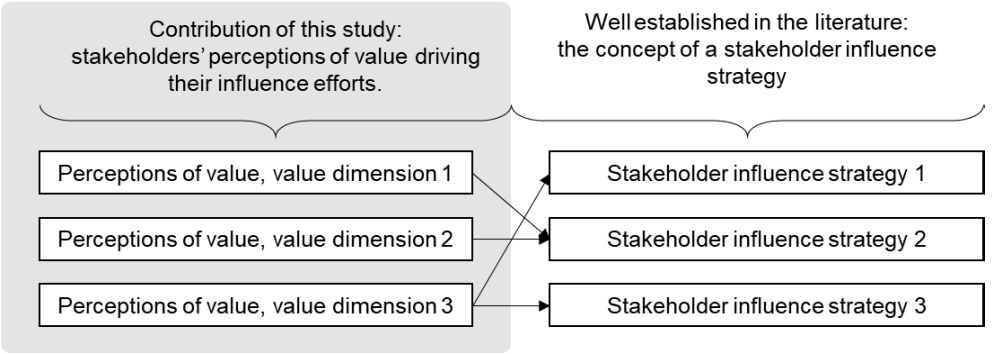

Figure 11. Stakeholders' perceptions of value driving their influence efforts.

The contribution is strengthened when the findings of Article I and Article IV are combined. The more general contribution states that in temporary organizations, various actions to influence are taken by different actors and targeted at different dimensions of value. Several recent studies have implicitly discussed how stakeholders' dissatisfaction with or concern regarding a temporary organization can drive stakeholder influence efforts (Liu et al., 2018; Mok et al., 2017; Nguyen et al., 2019; van den Ende and van Marrewijk, 2019). This dissertation demonstrates a more explicit linkage between value and influence efforts.

5.4 Managing value creation in temporary organizations

The goal of this dissertation was to create understanding of the management of value creation in temporary organizations. This dissertation has fulfilled this goal in four ways: by proposing value orientation as a source of task complexity, by proposing a framework for managing value creation, by describing the nature of managing value creation in the execution phase, and by highlighting the multi-level nature of value creation in temporary organizations.

The dissertation builds on three theoretical viewpoints: temporary organizing (Bakker, 2010; Lundin and Söderholm, 1995; Packendorff, 1995), the embedded temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003), and value creation in temporary organizations (Laursen and Svejvig, 2016; Martinsuo et al., 2019a, 2017; Winter and Szczepanek, 2008). Regarding value creation, this dissertation highlights the three characteristics of value: lifecycle orientation, multidimensionality, and subjectivity. The contributions of this dissertation build on

combinations of the three theoretical viewpoints and the three characteristics of value.

The first contribution of this dissertation proposes value orientation as a source of complexity in temporary organizations. According to Geraldi et al., complexity of projects is "something that is experienced by project managers" (2011, p. 968). Complexity is a multidimensional concept, the most established dimensions being technological complexity (Shenhar, 2001), uncertainty (Geraldi et al., 2011; Shenhar, 2001) and structural complexity (Geraldi et al., 2011), for example. This dissertation proposes value orientation as a novel dimension of complexity, in other words as another challenging factor project practitioners need to "deal with" (Geraldi et al., 2011, p. 967).

The key characteristic of a temporary organization is its task orientation (Bakker, 2010; Lundin and Söderholm, 1995). The idea of value orientation as a source of complexity (or "complicatedness", Geraldi et al., 2011) stems from the three characteristics of value. The lifecycle orientation of value broadens the focus of management from the "task that must be accomplished" (Lundin and Söderholm, 1995, p. 441) and from the fulfillment of the iron triangle objectives (Atkinson, 1999) to the whole lifecycle of the temporary organization — from the early front-end phase to the operations phase (Artto et al., 2016). The multidimensionality of value explains how the complexity of the task can take different forms. For instance, different control packages can be used to encourage desirable action with respect to the different dimensions of value (Article I). The multidimensionality of value resembles the idea of multidimensional project complexity and the different management practices for the different dimensions of complexity (Geraldi et al., 2011). The subjectivity of value reveals the stakeholders' varying or even conflicting perceptions of value (Ang et al., 2016; Green and Sergeeva, 2019) as a source of complexity. For instance, stakeholders' influence efforts are driven by their subjective perceptions of value (Article IV). The characteristics of subjectivity and multidimensionality are strongly linked with each other.

As the second contribution, this dissertation proposes that control, coordination and integration, and the stakeholder viewpoint form the framework for managing value creation in temporary organizations. The framework is illustrated in Figure 12.

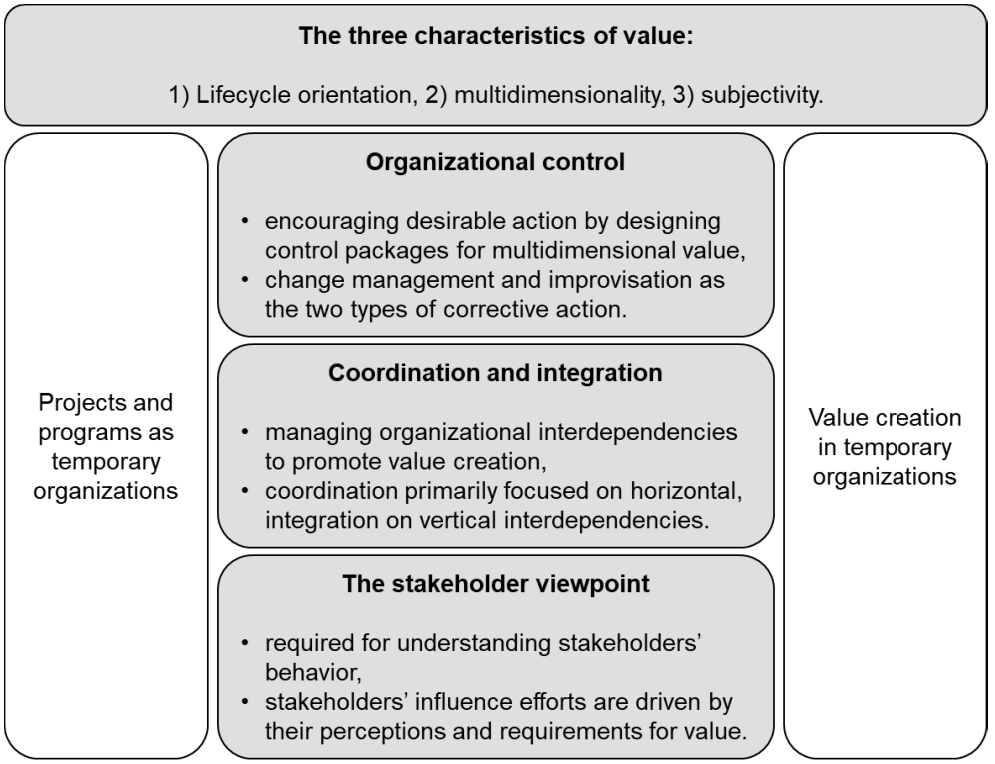

Figure 12. The framework for managing value creation in temporary organizations.

The previous chapters have demonstrated how control is a way to encourage desirable action toward value-oriented goals, how the management of organizational interdependencies (i.e., coordination and integration) promotes value creation at organizational interfaces, and how the stakeholder viewpoint enables understanding of the stakeholders' actions as driven by their perceptions of value. The three perspectives are not interchangeable; rather, they focus on different aspects of value creation. Thus, together, they form an overall framework for managing value creation. The three perspectives of the framework emphasize a contingency approach (Shenhar, 2001) to managing value creation as well. Although the three perspectives are not interchangeable, they can have different importance in different temporary organizations; the stakeholder viewpoint requires more focus in large delivery projects than in small internal development projects, for example.

The proposed framework emphasizes the challenging characteristics, based on the perspective of value creation and the three characteristics of value, in comparison to the viewpoints of projects as tools (Packendorff, 1995) or production functions (Turner and Müller, 2003). This way, this research contributes to answering

important questions asked in the earlier literature, including, for example, value management over the project/program lifecycle, different actors' involvement in value proposition, creation, and capture processes, and management strategies for adding value to projects (Martinsuo et al., 2017).

The third contribution of this dissertation discusses the nature of managing value creation in temporary organizations. The findings of this dissertation describe various events where "losses of value" were prevented. Examples include changes and related response actions (Article III), stakeholders' influence efforts (Article IV), and improved project team coordination (Article V). In contrast to preventing losses of value, earlier literature has described several aspects of value creation that focus more on creating additional value. Examples include definition of target benefits (Zwikael et al., 2018), facilitation of multi-organizational value creation (Artto et al., 2016), and enhancement of value capture and mitigation of value slippage (Bos-de Vos et al., 2019). However, these examples are more applicable to the earlier front-end phase or the later operations phase, than the execution phase. This dissertation proposes that the main focus of managing value creation in the execution phase is on preventing losses of value.

Finally, this dissertation highlights the multi-level nature of value creation; in other words, value creation and the need to manage value creation at different organizational levels. The three levels identified include: within the temporary organization, between the temporary and the permanent organization, and between the temporary organization and the external context.

To manage value creation at the first level — within the temporary organization — control and coordination are especially required. Control includes both encouraging desirable action and monitoring progress in terms of multidimensional value and taking corrective action through change management or improvisation if necessary. Coordination is a way to promote value creation at horizontal organizational interdependencies. At the second level — between the temporary and the permanent organization — the key management perspective is integration. Here the focus is on promoting value creation at vertical organizational interdependencies. Finally, the management of value creation between the temporary organization and the external context requires the external viewpoint, which in this case is the stakeholder view. The stakeholder viewpoint is especially related to the stakeholders' actions, which are driven by their subjective perceptions of value.

The idea of multi-level value creation builds on the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003). The earlier literature on embeddedness has described how temporary organizations

are embedded in different contexts, including organizational units, organizations, inter-organizational networks, and organizational fields (Sydow et al., 2004). This embeddedness and the interfaces between the various contexts is relevant for various fields of research, including, for example, project autonomy (Martinsuo and Lehtonen, 2009), project learning (Sydow et al., 2004), and project management offices (PMO) (Hobbs et al., 2008). This research proposes a similar linkage between embeddedness and value creation.

6 CONCLUSIONS

6.1 Scientific contribution

This dissertation has focused on the management of value creation in temporary organizations. By studying different types of temporary organizations (projects and multi-project programs) using qualitative research approaches, four contributions to the earlier literature have been made. This research offers solutions to project management frameworks to account for the lifecycle orientation of value creation and to the subjective and multidimensional nature of value.

Building on the three characteristics of value — lifecycle orientation, multidimensionality, and subjectivity — this dissertation has proposed that value orientation is a source of complexity in temporary organizations. The earlier literature has argued that the tasks performed by temporary organizations are diverse, finite, and complex (Bakker, 2010). By combining the viewpoints of temporary organizing (Bakker, 2010; Lundin and Söderholm, 1995; Packendorff, 1995) and value creation in temporary organizations (Laursen and Svejvig, 2016; Martinsuo et al., 2019a, 2017; Winter and Szczepanek, 2008), this research has complemented the general idea of complex tasks (Bakker, 2010) and complexity of projects (Geraldi et al., 2011) by offering value orientation as a novel source of task complexity.

To respond to the above-described complexity, this dissertation has proposed a framework for managing value creation in temporary organizations. The framework consists of three elements: organizational control, management of organizational interdependencies (coordination and integration), and a stakeholder viewpoint. The elements are not interchangeable, but they complement each other by focusing on different aspects of value creation in temporary organizations. The different focus areas of the three elements emphasize a contingency approach (Shenhar, 2001) to managing value creation as well. The framework responds to the calls for a better understanding of management strategies for value creation in projects and programs (Martinsuo et al., 2017).

By focusing on the management of value creation in the execution phase, this dissertation has revealed a strong focus on preventing losses of value. This focus

differs from the earlier front-end and later operations phases, where the creation of additional value and the exploitation of opportunities seem to be more evident.

Building on the embeddedness of the temporary organization (Bakker, 2010; Sydow et al., 2004; Turner and Müller, 2003), this dissertation has highlighted how value creation takes place and has to be managed at different organizational levels. The three organizational levels of value creation include are within the temporary organization, between the temporary and the permanent organization, and between the temporary organization and the external context. At all three levels, different management viewpoints are required. Moreover, this idea of multi-level value creation answers the calls for a better understanding of the management of value creation in temporary organizations (Martinsuo et al., 2017).

Finally, this research and the articles comprising this dissertation have made specific contributions to the literature on organizational control, the management of organizational interdependencies, and the stakeholder viewpoint. Regarding control, this research has demonstrated how different control packages are not only required for different projects, but also for different dimensions of value (Article I). This dissertation has also described two types of corrective actions — change management and improvisation — that are used to ensure the progress of a project (Article III). Regarding the management of organizational interdependencies, this research has proposed the concept of an integration task as the purpose or goal of integration (Article II) and emphasized the parent organization's viewpoint on promoting coordination (Article V). Regarding stakeholder theory, this dissertation has argued that stakeholders' perceptions of value drive their efforts to influence temporary organizations (Article IV).

6.2 Managerial implications

Abundant research has demonstrated how project-based organizing has spread to almost all kinds of organizations (e.g., Midler, 1995; Schoper et al., 2018; Whittington et al., 1999). Consequently, this research has important implications for practitioners as well. In contrast to the viewpoints conceptualizing projects as tools (Packendorff, 1995) or production functions (Turner and Müller, 2003), the viewpoint of value creation (Laursen and Svejvig, 2016; Martinsuo et al., 2019a, 2017; Winter and Szczepanek, 2008) emphasizes the creation of value for a wider range of stakeholders over a longer timeframe. This way, value creation can be considered a more ambitious perspective on projects and project management. However, the findings

of this dissertation demonstrate that value creation in temporary organizations does not take place automatically, but it has to be managed actively. In other words, value orientation acts as an additional source of task complexity in temporary organizing.

The management framework created in this research (Figure 12) illustrates how organizational control, the management of organizational interdependencies (coordination and integration), and the stakeholder viewpoint are different perspectives on managing value creation in temporary organizations. The three perspectives are not interchangeable, but they complement each other through their different areas of focus. The focus of organizational control is on encouraging desirable action toward the multidimensional, value-oriented goals. The focus of coordination and integration is on managing organizational interdependencies within and around the temporary organization. The stakeholder viewpoint, on the other hand, shifts the attention to the external context and emphasizes the interests of external stakeholders in the temporary organization. The complementary relationships between the three management perspectives are strengthened when the multi-level nature of value creation is considered. In addition to the different focus areas, the three management perspectives are relevant on different organizational levels as well.

The more specific contributions of this dissertation regarding the three management perspectives also have managerial implications. According to the findings of this research, different control packages should be designed for different dimensions of value. Regarding organizational interdependencies, this study makes a distinction between coordination and integration. Coordination is a way to sync and align horizontal interdependencies, while the focus of integration is more on vertical interdependencies, such as between the temporary and the permanent organization. Regarding the stakeholder viewpoint, this study proposes stakeholders' perceptions of value as a driver of their efforts to influence temporary organizations. This highlights the importance of analyzing and evaluating stakeholders' perceptions in order to manage and anticipate their behavior.

6.3 Validity and reliability

This section discusses the quality of this research in terms of its validity and reliability. Some authors have argued that validity is not as critical in qualitative research as it is in quantitative research and proposed alternative measures to consider, such as trustworthiness, authenticity, and credibility (Creswell, 2014).

However, in this research I use the more established terms of validity and reliability. These terms are also typically used in case study research (Yin, 2014), thereby justifying the choice made for this research.

Generally, validity is one of the strengths of qualitative research (Creswell, 2014). Following Yin (2014), validity can be divided into construct, internal, and external validity. Construct validity refers to the "accuracy with which a case study's measures reflect the concepts being studied" (Yin, 2014, p. 238). To ensure construct validity in this research, multiple data sources were utilized (i.e., data triangulation) (Creswell and Clark, 2018; Yin, 2014). In all the articles, the primary data (interviews or newspaper articles) were complemented with project documentation as secondary data. Regarding the interview-based articles, the key informants reviewed the draft reports (i.e., member-checking) (Creswell and Clark, 2018; Yin, 2014). In all the articles, the findings were written so that a logical chain of evidence and data transparency were visible (Yin, 2014).

Internal validity can be defined as "the strength of a cause-effect link made by a case study" (Yin, 2014, p. 239). In qualitative case studies, internal validity is mainly a concern for explanatory case studies (Yin, 2014). In this dissertation, none of the articles are explanatory case studies and none of the articles propose causal relationships. However, to improve the internal validity, pattern matching (Yin, 2014) was used in the data analysis when identifying the dimensions of value (Articles I and IV) and stakeholder influence strategies (Article IV), for example.

External validity refers to "the extent to which the findings from a case study can be analytically generalized to other situations that were not part of the original study" (Yin, 2014, p. 238). In a qualitative case study, the target is analytic generalization, not statistical generalization (Yin, 2014). Two approaches were used to improve the external validity (i.e., analytic generalizability of the findings). In the single-case studies (Articles I, III, and IV), theory was used to discuss the limits of the findings. In the multiple-case studies (Articles II and IV), replication logic was used for selecting the cases. However, the empirical focus of the articles is limited to transport infrastructure projects (Articles I and IV), organizational change programs (Article II), and the engineering industry (delivery project in Article III and maintenance projects in Article V). In addition, different temporary organizations have been studied in the individual articles. This limits the generalizability of both the findings of the individual articles, and the overall contributions of this dissertation. Further research in different contexts is required to evaluate the generalizability of the findings.

Finally, the objective of reliability is to ensure that if a later researcher were to conduct the same case study again, they would reveal the same findings and conclusions (Yin, 2014). Generally speaking, good planning is considered important for securing the quality of research — especially reliability. As suggested by Yin (2014), all the case studies were carefully planned. Planning covered the data sources (interviewees or media archives), the aims of the studies, and the interview protocols, for example. In all the interview-based studies, the interviews were recorded and transcribed, and the transcripts were checked for errors. The interviewees were granted full anonymity, their participation in the research was voluntary, and the interviewer tried his best to make the interviewees feel comfortable in the interview situations.

6.4 Limitations and avenues for future research

The main limitations of this research relate to its empirical setting and delimitations. The focus of this dissertation was mostly limited to the execution phase of temporary organizations. As instructed by the lifecycle orientation of value and by the earlier literature (e.g., Artto et al., 2016), the early front-end and the operations phases are highly relevant for value creation as well. Thus, additional research should focus on the management of value creation in the front-end phase or in the operations phase. The findings of this dissertation reveal a strong focus on preventing losses of value in the execution phase. In the front-end and operations phases, other aspects, such as the creation of additional value and opportunity exploitation, could become more relevant as well.

Following the focus on the execution phase, this research studied organizational control, management of organizational interdependencies, and the stakeholder viewpoint as perspectives on managing value creation. Consequently, of the five elements of management proposed by Fayol (1949), planning and organizing were excluded. Similarly, this study did not focus on leadership, or "commanding" (to borrow Fayol's terminology). All three excluded elements — commanding, organizing, and planning — are potential avenues for future research on the topic. In addition, this dissertation focuses on value creation combined with the three management perspectives. Without a doubt, there are other viewpoints explaining the practices of organizational control and management of organizational interdependencies, and stakeholder actions in temporary organizations. For instance,

mobilization theory and social movement research (e.g., Rowley and Moldoveanu, 2003) provide interesting insight on the rationales behind stakeholder behavior.

As for the types of temporary organizations, this research limited its focus to projects and multi-project programs. Although projects and other project-based activities are the most typical kinds of temporary organizations (Bakker, 2010), other kinds of temporary organizations could be the topic of additional research as well. Regarding the studied projects and programs, this study focused on four different kinds of temporary organizations: infrastructure projects, organizational change programs, repetitive maintenance projects, and system delivery projects. The limited number of projects and programs and the qualitative research approaches of this study limit the generalizability of the results. Further research should focus on the management of value creation in different types of projects and programs and utilize quantitative research approaches as well.

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PUBLICATIONS

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Sustainable project management through project control in infrastructure projects

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Sustainable project management through project control in infrastructure projects

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Abstract

Sustainability is becoming increasingly important in the delivery of projects as stakeholders require ethicality, eco-friendliness, and economic efficiency during a project's life cycle. Previous studies focused on the environmental aspects of sustainability in project deliverables, whereas less attention has been directed at sustainable project management during project delivery. The goal of this study is to identify the control practices that a project organization uses for sustainable project management. A qualitative single-case study was conducted on a large infrastructure project in which a road tunnel was constructed in a highly demanding environment, involving multiple stakeholders in an alliance contract. The results reveal that sustainable project management is implemented using not only indicators but a holistic control package in which control mechanisms are used differently for different sustainability dimensions. Internal project control is complemented with sustainable project governance, linking the project to its external stakeholders and regulations. The alliance contract activates the partners to exploit innovation opportunities and, thus, promotes economic, environmental, and social sustainability.

Keywords: Sustainability; Project control; Sustainability indicators; Sustainable project management; Public–private partnership (PPP); Alliance

Executive summary

Sustainability is an important project goal complementing other aspects of value and benefits. Sustainability is commonly understood through its three components, often referred to as the triple bottom line (economic, environmental and social sustainability). In project business, the sustainability of the deliverable and the sustainability of the delivery process are both very important as they can have remarkable social and environmental impacts. Sustainable project management is particularly relevant for infrastructure projects that cause enduring changes in the community and involve multiple stakeholders with varying expectations. Project control is used to make sure that the goals of the project are met, but so far it has been covered in connection with sustainability only in terms of performance indicators. There is a need for knowledge on the use of more versatile approaches to sustainability-oriented project control in infrastructure projects.

This paper explores sustainable project management through project control especially in the project execution phase of an infrastructure project. The focus is on how the project organization implements sustainability during project execution, and how project control is used for sustainable project management, both in terms of control mechanisms and the alliance contract of the project partners. A single case study was implemented concerning the construction of a road tunnel in the middle of a city, and it was chosen because of its publicity, accessibility, complexity and demanding conditions. Document data and in-depth interviews were used as sources of data.

The case study revealed that the alliance model was experienced as an enabler for sustainability as it made the cooperation between the customer, contractor and owner easy, and promoted risk and benefit sharing. Joint planning and the

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shared incentive model promoted innovations for reaching sustainability goals, stakeholders' fluent cooperation, and sustainable practices. Planning took place both outside (through local, regional and legal requirements) and inside the project organization, and plans at different levels guided sustainable project management. Performance indicators and monitoring were used for implementing and following up sustainability, but somewhat differently for each sustainability dimension. Some further control mechanisms were identified, specifically for each sustainability dimension. Implementing sustainability goals by adding them to the existing project control mechanisms was preferred over adding new ways of sustainability specific control.

This study contributes to research on sustainable project management in three main ways. It shows through the infrastructure project example the dependencies between sustainability dimensions and the benefits of an alliance contract in enabling and driving balanced sustainable practice. It reveals the use of a control package in managing sustainability during project execution and, thereby, offers new knowledge that complements previous indicator and monitoring-centric research on sustainability-oriented project control. In particular, the results show a special configuration of control mechanisms for each of the dimensions of sustainability and the division into internal and external control mechanisms. Finally, when revealing the centrality of external control through regulations and the alliance contract, the study draws attention to sustainable project governance as a prospective new research avenue in the implementation and control for sustainability.

1. Introduction

Projects may succeed and fail in terms of how they reach their goals and how they are managed (Lehtonen and Martinsuo, 2006). The achievement of project goals requires efficient project control (Nieminen and Lehtonen, 2008). Recently, companies and researchers have become increasingly concerned with sustainability as a project goal and as a characteristic of the process through which the project is managed (Gareis et al., 2013; Silvius and Schipper, 2014). Although much research attention has been directed at sustainability-oriented performance indicators and assessment, less is known about sustainable project management, that is, the practices through which projects are controlled to ensure the achievement of their sustainability goals. This study explores the use of project control in sustainable project management in an infrastructure delivery project.

There is no widely agreed on definition for sustainability or sustainable project management (Aarseth et al., 2017). Most of the literature builds on the Brundtland Commission's definition of sustainable development: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, WCED, 1987). Despite the high number of different definitions (over 100 according to Aarseth et al., 2017), there is a common agreement that sustainability can be divided into three individual, but interlinked and equally important, dimensions: economic, social, and environmental sustainability (Elkington, 1997, e.g., 1994). This so-called triple bottom-line approach (e.g. Silvius and Schipper, 2014) encourages treating environmental and social issues in the same way as economic aspects when doing business.

One potential area for practical implementation of sustainability is sustainable project management. In project management, attention is clearly moving from immediate project goals to broader business benefits (Atkinson, 1999; Shenhar et al., 2001) and dimensions of value that are more versatile (Martinsuo and Killen, 2014). Companies need ways to incorporate sustainability into project management processes and shift from focusing on the iron triangle of cost, time, and quality to broader impacts (e.g. Silvius and Schipper, 2014). Acknowledging sustainability is extremely important in delivery projects where the deliverables and processes may have a substantial impact environmentally and socially. It is not enough for the company to evaluate the sustainability of the project deliverable, but the project delivery process has to be sustainable as well.

In the present study, in line with Silvius and Schipper (2014, p. 79), we focus on sustainable project management in terms of the practices of "ensuring profitable, fair, transparent, safe, ethical and environmentally friendly project delivery - aiming at a project deliverable that is socially and environmentally acceptable throughout its lifecycle." As the definition points out, sustainability in projects can be viewed from two perspectives: the sustainability of the project delivery (i.e., the process) and the sustainability of the project deliverable (i.e., the product; e.g. Gareis et al., 2013). The focus of this study is the sustainability of the project delivery. Often, the process and product aspects of sustainability are highly interconnected.

Taking into account the three dimensions of sustainability (the triple bottom-line approach) and the two perspectives (the project delivery and the project deliverable), we study sustainable project management in the context of infrastructure delivery projects that offer value to their customers over a long period of time and involve many stakeholders (Kolltveit et al., 2004; Smyth and Edkins, 2007). Infrastructure projects are typical examples of large complex projects that involve diverse stakeholders and require collaboration between public and private sectors (van Marrewijk et al., 2008; Walker and Jacobsson, 2014). They are typically carried out in public–private partnerships where public sector organizations are the investors and the projects are delivered by private sector companies or consortia. Alliance contracts have received growing research interest in public–private partnerships and they have been proposed as beneficial for sustainability in project deliveries, but more research has been called for (Walker et al., 2015). Sustainability plays a central role in the stakeholders' expectations for infrastructure delivery projects, and fulfilling these expectations during project execution is vital. The implementation phase may cause stress to the surrounding social community and environment and pose a risk of accidents to the operational workforce, for example.

Sustainability can be managed in various ways throughout the delivery of the project (Aarseth et al., 2017). The early phases of the project are critical for defining the total value generated by the project and putting innovations in place

(Klakegg, 2009; Kolltveit and Grønhaug, 2004). Companies make significant sustainability-related decisions even with incomplete information on decision parameters and consequences quite early (Wu and Pagell, 2011). During the execution of the project, such value-innovating activities may continue (Kolltveit and Grønhaug, 2004), information is updated, and decisions are implemented in the material choices, process steps, and resource consumption that are manifested in the project deliverables. Previous research on sustainability has focused on the design and planning phase of projects when key performance indicators are created (Boz and El-adaway, 2015; Fernández-Sánchez and Rodríguez-López, 2010; Hwang and Tan, 2012; Klakegg, 2009; Shen et al., 2011). However, limiting the focus of sustainable project management to the design and planning phases of projects is insufficient; the project execution phase is crucial for ensuring the projects are delivered in a sustainable way.

Project control is a central part of the project execution phase. Project control can be defined as "encouraging behavior that is desirable to achieving the organization's objectives" (Cardinal et al., 2010). Control is practiced by utilizing different control mechanisms which can be grouped into various control modes and configured into a full control package. The context-specific use of different control configurations is a well-accepted phenomenon in management control research (Malmi and Brown, 2008), but so far previous studies have not taken such a holistic view to project control for the different dimensions of sustainability (Cha et al., 2009; Shen et al., 2011). Different control modes have been considered as useful for different types of objectives (Nieminen and Lehtonen, 2008), implying that the achievement of immediate project objectives and longer-term value goals are not necessarily controlled with the same control modes. This suggests that the current focus of sustainability literature on performance indicators provides an incomplete image of sustainability-oriented project control. To make sustainable project management successful and create sustainable value through the project, a holistic view to project control is needed. Therefore, there is a need for research that shows whether and how project organizations use holistic project control for sustainable project management.

The purpose of this study is to explore sustainable project management through project control especially in the project execution phase. The goal is to identify control practices through which a project organization implements sustainable project management. The study addresses the following research questions:

1. How does the project organization implement the three dimensions of sustainability?
2. How does the project organization use project control for sustainable project management?

The focus is limited to infrastructure delivery projects, particularly the perspective of the alliance organization delivering the infrastructure, and sustainability practice and its project control and management. The focus is on exploring sustainability control mechanisms during the execution phase of the infrastructure project, but the planning phase is included wherever necessary to maintain a link between the issues in the execution phase.

A case study was conducted to explore sustainable project management through project control. The case is a topical example of a large infrastructure project: constructing a road tunnel to replace an existing road through a project organization with a modern public–private partnership (PPP) contract. The special characteristics of the case project include a central location in the city, use of an alliance model, and the participation of the city and a state-owned transportation agency.

In the following section, previous research on sustainability goals, sustainable project management, and the use of project control practices and contract models in infrastructure projects is reviewed. Then, the case research design is described, and the specific features of the tunnel case and the document and interview-based data collection and analysis are introduced. The results show evidence of the use of different control mechanisms as a control package in sustainable project management, point out the need to complement internal project control with sustainable project governance, and reveal the central role of the alliance contract as an integrative framework for sustainability-oriented project control. Finally, in response to the research questions, the findings are discussed in light of previous research. The contributions of the paper to research on sustainable project management are highlighted, along with key limitations and suggestions for future research.

2. Literature review

2.1. Sustainability goals and sustainable project management

Projects are implemented to achieve a certain goal and selected objectives. In addition to the iron triangle objectives of scope, time, and cost, companies are increasingly concerned with a project's broader benefits and value (Silvius and Schipper, 2014). The strategic value of a project can be considered in terms of various social, ecological, and economic dimensions (Martinsuo and Killen, 2014) that are featured in sustainability. Benefits, value, and value creation may imply different things to the project contractor and the customer (Winter and Szczepanek, 2008) and appear differently during the different phases of the project's and the product's life cycle (Labuschagne and Brent, 2005), thus making the specification of project goals very challenging.

Sustainability in delivery projects can be viewed from different perspectives. Previous research has recognized four aspects of sustainability: product related, process related, organization, and people (Marcelino-Sádaba et al., 2015). Sustainability in project business concerns the process of the project delivery and the project deliverable (Gareis et al., 2013). In this study, the focus is on sustainable project management, that is, the project delivery side of sustainability. However, as the project deliverable is designed and implemented during project delivery, the project deliverable is also affected by sustainable project management.

Sustainable project management implies the use of practices that ensure social, ecological, and profitable delivery of the project so that the project deliverable is socially and

environmentally acceptable throughout its life cycle (Silvius and Schipper, 2014). Sustainable project management involves and builds on stakeholder cooperation (Eskerod and Huemann, 2013), includes life cycle thinking (Labuschagne and Brent, 2005), and balances the three dimensions of sustainability (Silvius and Schipper, 2014, building on Elkington, 1997). Klakegg (2009) suggested several reasons for the lack of sustainability in project management: conflict of interest, lack of commitment from key stakeholders, low economic benefits of sustainability compared to the required investment, and changing conditions.

Various practices have been introduced to characterize sustainable project management. For example, Klakegg (2009) proposed clearly expressing sustainability as an evaluation criterion, holistic planning with sustainability included in the bottom line, reviewing relevant stakeholders' concerns and expectations, and ensuring flexibility of the delivery of the project to increase the value of the investment. Saving energy during the construction phase and during the life cycle of a building helps cut greenhouse gas emissions (Zhang et al., 2015). Considering the life cycle perspective in road construction projects helps reduce the greenhouse gas emissions involved (Barandica et al., 2013). Sustainability and project management should be integrated (Marcelino-Sádaba et al., 2015) to make sure that project management is updated and ready to face global sustainability-related problems.

2.2. Project control for sustainable project management

The existing literature on sustainable project management has focused mostly on the design and planning phases of projects. To deliver a sustainable infrastructure project, the project also has to be actively managed toward its goals during the implementation phase, and this management is covered in project control. Project control is defined as "encouraging behavior that is desirable to achieving the organization's objectives" (Cardinal et al., 2010). In this study, an organization's objectives include the sustainable delivery of projects, and project control is a way to manage projects toward their sustainability goals.

Achieving project goals during project execution has typically been built upon the definition of clear performance measures and verified through the use of various diagnostic project control tools, such as earned value analysis (e.g., Anbari, 2003) and project health checks (e.g., Jaafari, 2007). In addition, a holistic viewpoint can be taken for project control, following a behavioral science approach and building on organizational control, rooted in permanent organizations and manager–subordinate relationships (e.g., Ouchi, 1979; Simons, 1994). In the holistic view, control can take many forms, and it is typically divided into control modes (e.g., formal and informal control) and control mechanisms (e.g., rules, plans, budgets, schedules, and social control; Nieminen and Lehtonen, 2008).

Organizations utilize different combinations of control modes and mechanisms in different projects (Kirsch, 1997; Liu et al., 2014; Nieminen and Lehtonen, 2008), and this combination may be referred to as a control package. For example (Nieminen and Lehtonen, 2008), the control mode of bureaucratic control includes various boundary mechanisms (rules, directives, codes of conduct) and diagnostic mechanisms (plans, budgets, resource allocation, schedules, performance measures, incentives, reports). The control mode of clan control may feature belief mechanisms (mission statement, vision, values) and interactive mechanisms (project manager selection, training, team control, culture). The control mode of self-control may include autonomy on three levels (decision power on daily matters, working methods, project goals).

The existing project control literature has focused on understanding the antecedents and the performance effects of different control package configurations in different projects (Liu, 2015). However, regarding the desirable objectives toward which project control is targeted (Cardinal et al., 2010), the existing studies have either taken a broad consideration or, at least implicitly, focused on the iron triangle objectives. None of the existing project control studies cover the use of control mechanisms for sustainable project management. In addition, few studies have focused on infrastructure projects with a holistic approach to project control.

In the sustainability literature, different diagnostic mechanisms, primarily performance indicators, have been reported as the main method for managing and ensuring sustainability (Amiril et al., 2014; Fernández-Sánchez and Rodríguez-López, 2010; Haponava and Al-Jibouri, 2010; Shen et al., 2011; Ugwu et al., 2006). These indicators are typically determined during the initiation and planning phases of the project, and they are then used as key measures for monitoring project status or performance in the project execution phase (Aarseth et al., 2017). According to the literature, these indicators should be case-specific (Ugwu et al., 2006), cover multiple dimensions of sustainability (Amiril et al., 2014), and meet the varying goals of different stakeholders (Fernández-Sánchez and Rodríguez-López, 2010). However, the empirical results of utilizing sustainability indicators vary (Gareis et al., 2013; Haponava and Al-Jibouri, 2010). Shen et al.'s (2011) review pointed out that, in general, the proposed indicator sets fail to meet the stated goals for the three dimensions of sustainability (economic, environmental, social).

Although indicator sets that are holistic exist (Shen et al., 2011), many of the proposed indicator sets focus on a particular dimension of sustainability, for instance, on the environmental dimension. Even if a holistic indicator set is utilized, considering the dimensions separately can lead to trade-offs between the dimensions (Bond et al., 2012). Thus, a systemic approach targeting net sustainability gains should be adopted (Gibson, 2006). Developing new sets of performance indicators for sustainability may be considered simply "yet another new system" by project personnel (Gareis et al., 2013). Instead of having a separate system for sustainability goals, empirical results have shown that sustainability issues and indicators should be an integral part of a company's existing project management model (Gareis et al., 2013).

In comparison with the wide range of control mechanisms identified in the general project control literature, monitoring and use of performance indicators provide an incomplete image of project control when pursuing sustainability goals. The indicator-centric approach to control may be problematic as

project performance indicators often lag (Williams et al., 2012) and may not cover the project value and benefits over the project life cycle. Fig. 1 concludes the initial framework for this study. The research evidence from the general project control literature would suggest a wider set of control mechanisms (i.e., a control package) also with respect to project sustainability goals, despite the dominant emphasis on performance indicators and monitoring. This study focuses on the triple bottom-line approach during project implementation, and acknowledges that various stakeholders are involved in the project.

2.3. Contract models guiding project control in infrastructure projects

Infrastructure delivery projects are typically public-sector investments, with long-term goals aimed at creating or improving specific infrastructure, such as roads, residential areas, tunnels, electricity grids, or railroads. Today, instead of direct public procurement, infrastructure projects are often delivered through a project consortium that may involve private-sector firms in the financing, design, delivery, and operation of the infrastructure. These PPPs have become more common during the past few decades and take many forms (Walker and Jacobsson, 2014). PPP good practices are increasingly studied and understood. Some PPP contracts are formal alliances that imply early partner involvement, risk and benefit sharing, and highly collaborative project delivery (Turner and Simister, 2001; Walker and Lloyd-Walker, 2016). PPP projects vary in their complexity and uncertainty, and alliances are seen as particularly suitable for high degrees of complexity and uncertainty (Turner and Simister, 2001).

Alliances in PPP projects have been considered particularly suited for situations where uncertainty about the project deliverable and project delivery and complexity are high, and the customer could contribute to the project (Turner and Simister, 2001). Alliance forms of PPP contracts have been studied in different contexts, such as in transportation, tunnel, and railway projects (Guo et al., 2014; van Marrewijk et al., 2008; Walker and Jacobsson, 2014), the offshore oil and gas industry (Halman and Braks, 1999), and construction projects (Walker and Lloyd-Walker, 2016). Alliances are perceived as suitable for enhancing value-for-money, reducing risks and costs, and improving project performance (Halman and Braks, 1999; Suprapto et al., 2015; van Marrewijk et al., 2008).

Much of the previous research on PPP projects has focused on approaches to contracting, planning, and negotiating or forming alliances at the front end of the project (Walker and Jacobsson, 2014; Walker and Lloyd-Walker, 2016); assessing, modeling, managing, and sharing risk (Clifton and Duffield, 2006; Grimsey and Lewis, 2002; Guo et al., 2014; Ng and Loosemore, 2007); and managing trust, collaboration, and relationships (Ruuska and Teigland, 2009; Smyth and Edkins, 2007; Zou et al., 2014). Previous researchers acknowledged that infrastructure projects by nature pursue long-term service outcomes (Clifton and Duffield, 2006) and involve long payback periods (Ng and Loosemore, 2007). Thus, the sustainability of a project's deliverable or a product's life cycle must be considered (Lenferink et al., 2013). Walker et al.'s (2015) study revealed that sustainability issues are clearly and well covered in project goals at least in Australian alliance projects.

In sustainable project management of infrastructure delivery projects, the entire life cycle of the project must be considered, especially its impact on relevant stakeholders. Large projects and infrastructure delivery involve and affect many stakeholders (Kolltveit and Grønhaug, 2004; Smyth and Edkins, 2007; van Marrewijk et al., 2008), each of which, particularly in PPPs and alliances, may have its own perceptions of sustainability value. To ensure that a project is sustainably managed, the different perceptions that stakeholders have of sustainability must be understood (Abidin and Pasquire, 2007), and a common sustainability goal should be found among the stakeholders (Fernández-Sánchez and Rodríguez-López, 2010). In addition, cooperation is required among stakeholders to ensure and maintain sustainability (Shen et al., 2007).

Regarding the assessment of sustainability, each project should be examined individually, and stakeholders should be involved throughout the assessment process (Bond et al., 2012). In a study of project deliverable-related sustainability, the inclusion of customers, owner/operators, contractors, and sustainability

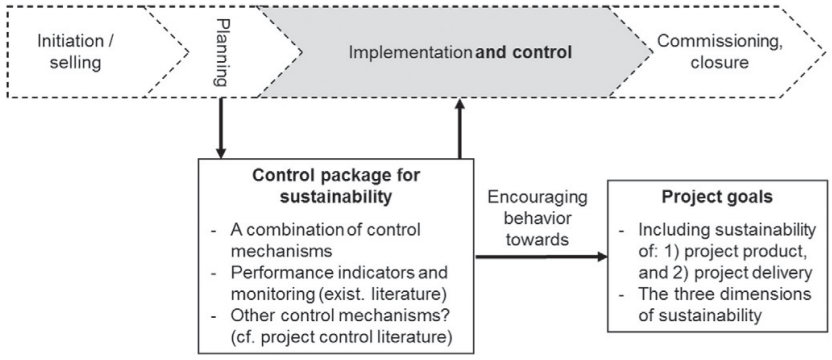

Fig. 1. Initial framework: project control toward sustainability goals.

consultants in the project design phase was reported to lead to lower operation costs and better energy efficiency, durability, and maintainability of the building in question (Wang et al., 2014). In a study of Dutch road infrastructure projects, including partners in design-build-finance-maintenance projects optimized the project's life cycle (Lenferink et al., 2013). The same study found that the reward criteria set during contracting improved the stakeholders' inclusiveness. In a study of infrastructure projects, including stakeholders in the development of the projects yielded a number of benefits, for example, greater access to resources, increased transparency, and increased support among the stakeholders (Arts and Faith-Ell, 2012). Such benefits are helpful in ensuring the sustainability of a project. Nevertheless, various challenges exist in all project phases that can reduce or hinder inclusiveness.

To conclude, sustainable project management has not received enough attention, and the viewpoint of project control for sustainability has been covered merely from the perspective of diagnostic controls (indicators and their monitoring) and dominantly for environmental sustainability. As infrastructure projects are intended to deliver value-creating capacity for their stakeholders over a long time, their sustainability value needs to be built proactively, and their social and environmental impacts need to be controlled already during projects execution. To complement previous research, the present study adopts a proactive approach to sustainability and explores how project control is used in sustainable project management.

3. Methodology

3.1. Research design and case background

We followed a case study methodology, due to the exploratory nature of the research, the limited amount of previous research in sustainable project management, and the intent to develop knowledge on the phenomenon of promoting sustainability in its real-life context. Case studies have been considered particularly suitable for how and why research questions and for studying a contemporary phenomenon in its real-life context particularly when the boundaries between the phenomenon and the context are not clearly evident (Yin, 2014, p. 9). To gain access to a case replete with sustainability practice, we designed a holistic single-case study setting in which the intent was to identify a critical case (Yin, 2014, pp. 50–51) of an ongoing and, thus, topical infrastructure delivery project in which sustainability is relevant. We scanned alternative, ongoing public–private partnership projects in search of a case that would be topical, publicly well communicated, accessible, and ongoing so that document data could be complemented with key informant interviews.

The chosen infrastructure project is a road tunnel project in Finland. The estimated budget is approximately 180 M€ (excluding VAT), and the execution phase is scheduled to last from October 2013 to October 2017. Considering the project environment, the project is remarkable with a notable impact on the traffic in and around the city where the tunnel is being built. The project has generated 1000 person-years of work and employs 300 persons, on average. The scope of the project includes drilling, blasting, excavating, and building a road tunnel and all the related and needed road re-organization activities and other infrastructure additions and modifications. The project is highly demanding due to its context: The tunnel is located in the middle of a city and is affected by nearby water areas. These two aspects make the project environment quite challenging and complicated: The project must be executed in such a manner that its effects on the inhabitants, buildings, and city infrastructure are anticipated, minimized, and communicated well during construction, and the risks regarding the nearby water areas in terms of environmental effects and threats of flooding are mitigated well. Due to the project's significant influence on the city inhabitants over many years, the project's progress has been communicated broadly in the public media, which enables an in-depth document-based study.

The project involves five main partners, and its PPP contract follows the logic of an alliance. Alliance means a consortium — formed between the customer (investor, owner) and one or more contractors and/or possible public institutions — that shares the risk and benefits of the project at hand. The alliance includes the national transportation agency as the owner of the project, the city as the sponsor, the private-sector main contractor, and two private-sector planning offices as the central delivery partners. In addition to the core of the alliance, the larger project network includes numerous subcontractors and other actors (e.g., authorities). For the project investigated in this study, value-for-money, risk and cost reduction, and mutual performance expectations were the foundation for why an alliance was selected as the contract form. A relational approach (i.e., an alliance) (Hobbs and Andersen, 2001) was used in the front end and in the execution phase of the project.

The case research design included a document-based event study that was complemented with key informant interviews. Due to the sensitive nature of the project context, the project activities have been communicated extensively through public media, which offered a rich source of data for this study. As the project was ongoing at the time of the study, key informant interviews were chosen as a means of adding depth and detail to map the practices of promoting sustainability and to increase the validity of the findings.

3.2. Document data collection and analysis

Document-based data were collected mainly from public sources, including the most well-known newspaper in the target city (Newspaper 1), the most well-known newspaper in the target country (Newspaper 2), the Internet archives of both newspapers, and the project's website. The data include documents, such as news articles, the preliminary project plan, and a value-for-money report. A total of 350 news articles were identified starting from late 2007 until September 2016 (307 from Newspaper 1 and 43 from Newspaper 2). Of these articles, 84 were about the tunnel itself, and 266 articles were

Table 1
Summary of articles covering sustainability issues in the media news data.

Sustainability dimension	Newspaper 1	Newspaper 2	Total	Example quote
Economic	8	2	10	"It is likely that we will achieve savings through this way [alliance model] of working, [the director] estimates."
Environmental	10	2	12	"Protective equipment is used to prevent the water in the nearby lake from becoming dirty."
Social	44	2	46	"Today, Tuesday, a public hearing will be arranged for those living on the tunnel line."

about phenomena surrounding the project or only partly concerned the tunnel. All the articles were reviewed, and 76 articles were categorized as highly relevant for the sustainability study. The tunnel project has remarkable political significance, as politics was involved in more than one third of the articles (130/350). Fifty-eight articles covered one or more dimensions of sustainability.

The collected news articles were the primary data for sustainable project management, and they were systematically analyzed and categorized under the three sustainability dimensions. An issue was coded as "economic" when the newspaper article included a clear specific positive or negative statement about an economic effect, method, result, or need in the project. The issues labeled "social" or "environmental" were coded in a similar way, when social or environmental effects, methods, results, or needs appeared in the news. Table 1 presents the number of articles covering different sustainability dimensions and examples of each dimension to illustrate what types of issues were coded in each category. Some articles covered more than one dimension, and then all dimensions were coded.

A summary was formed from the categorized news articles and selected other documents, categorized into the environmental, economic, and social aspects of sustainable project management. The articles, the value-for-money report, and the preliminary project plan were cross checked to evaluate the consistency of the documents and to find possible new forms of sustainability as part of the project. We cross-tabulated the main findings and selected informative quotes to illustrate and enrich the key findings. When a quotation refers to a document source, the newspaper source is labeled in the quotation. This primary analysis was used as a foundation for developing the outline for the interviews.

As the news articles did not cover the internal control dynamics of the project and the alliance well, the control practices were primarily analyzed from official project documents and the interview data, while the news articles were treated as supportive material.

3.3. Interview data collection and analysis

We initially contacted the project manager of the alliance, to gain access to the project personnel knowledgeable about sustainable project management, and this contact person proposed other interviewees. The interviewees were chosen based on their expertise and central role in the project organization. Five key informant interviews were carried out, and the informants' roles and the duration of the interviews are summarized in Table 2. All the interviewees were male, and they have an average of 22 years of experience in project business (range 10...34). To ensure the anonymity of the interviewees, job title information is not provided when quotations are used to support the analysis. For this article, the quotations were translated from [the interviewees' original language] into English.

The semi-structured interview outline was developed based on the literature review about sustainability and sustainable project management, and the initial findings of the document analysis. The interview outline included topics concerning the role of the interviewee in the project, the PPP contract model, cooperation among the project stakeholders, and the respondent's experiences in the project's sustainability dimensions. The semi-structured approach enabled the interviewees to share their experiences and opinions very openly and broadly, and the interviewer could state further, more detailed questions, depending on the interviewees' responses. The interviews were recorded and transcribed.

The analysis of the interviews followed an ordinary thematic analysis approach and proceeded from reading and re-reading the transcripts to rough content-based coding. With sustainability dimensions, the same thematic approach and cross-tabulation were used as in analyzing the document data. Additionally, the sustainability-oriented properties and implications of the alliance contract were emphasized, and the stakeholders' different expectations were identified. These aspects were summarized. Regarding project control practices, three areas were coded: the activities of the controllers and controllees, the control mechanisms (further divided into planning, regulations, metrics and indicators, and external communication; and mechanisms related to the alliance contract), and the sustainability dimensions associated with each control mechanism. The coded data were grouped to aid in the case reporting, then illustrative quotes were selected, and the findings were summarized and cross-tabulated thematically. When writing up the results, we cross-checked and compared the document data and the interviews repeatedly, as a means of data triangulation.

Table 2
Summary of interviewees and interview duration.

Job title	Partner in the alliance	Interview duration
Project Manager	Contractor	68 min
Project Engineer	Contractor	94 min
Road Engineer	City	75 min
Project Manager	Transportation agency (customer)	91 min
Section manager for roads (safety officer)	Contractor	35 min

4. Results

4.1. The tunnel project overview

The delivery of the project relied upon an alliance contract, which is the term used for a consortium formed by the customer and one or more contractors and involving a clear risk- and benefit-sharing scheme. Construction of the tunnel had been discussed for a long time before the actual construction started, with the first idea mooted in the mid-1990s. The tunnel project was used as a tool in local and national politics, and its acceptance (or not) depended on the changing political climate of the time.

Before the project started, the target budget was a controversial political issue. The alliance model was chosen because it was considered the optimal way to achieve the target budget and schedule. No single contractor would have been able to competitively bid on such a large project due to pricing in the risks. With the alliance model, the risks could be mitigated, and the costs brought down. An interviewee stated, "I strongly believe that this project would not have been possible with any other forms of delivery."

The project was put out to tender, and two-step competitive bidding took place. Two alliance coalitions were invited to the second phase, and their proposals were assessed using a specific set of criteria. When the alliance coalition was finally selected, the planning phase started with a core team that included the contractors, the city representatives, and the national transportation agency. The planning phase continued from the fall of 2012 until the fall of 2013. Through close and open collaboration among the project organization members (i.e., the alliance) in the planning phase, the budget was reduced to an acceptable level. One interviewee explained the process:

> "The first estimate [before the beginning of the alliance collaboration] from our planning engineers was 220 MEUR. Over the course of one year [of the alliance collaboration], we made it to 180 MEUR, without altering the scope or reducing the quality."

After the last round of voting on the tunnel by the city council, the construction phase began in the fall of 2013. The early phases of the project implementation included the excavation, drilling, and blasting of the tunnel. At the time of writing this paper (late 2016), the tunnel project is nearing completion: the tunnel has just been opened for public use, new traffic routes have been established, and the project is ahead of schedule by six months.

4.2. Sustainability and sustainable project management in the tunnel project

When the project started, some extreme opinions in the media stated that the excavation and blasting had the potential to cause the collapse of apartment buildings close to the excavation sites. This danger was never real, but it gives an idea of how worried some stakeholder groups were and why they opposed the project. The media took a neutral stance in this debate, publishing articles for and against the tunnel project. Another concern voiced in news articles was that the construction would reduce groundwater levels. However, the media reported that the tunnel project would have a positive local effect on the construction industry in general.

The identified possible negative effects of the construction work on the environment included noise, dust, vibration, and exhaust gas emissions. In addition, waste pile-up in nearby bodies of water was reported in the media to have happened. The location of the project in the city center and close to large bodies of water meant that the surrounding area was very vulnerable to negative environmental effects. According to the preliminary project plan, the damage to and the effects on the environment during the construction phase should be as low as possible. The expectation of minimizing environmental effects was targeted through many little actions protecting or preserving the surrounding environment, for example, monitoring the groundwater levels and acting accordingly, preventing the water in the nearby lake from becoming dirty, and measuring multiple, predefined attributes from vibration to air quality.

In the alliance model, the actors make decisions jointly, and they try to find the best possible outcome through joint idea creation, a bonus system, and shared risk management and opportunity exploitation. The alliance model is based on mutual interests and clear plans that are agreed upon by all the partners in the alliance. The interviewees felt that one of the biggest advantages of the alliance model was the collaborative spirit, reflecting the social dimension of sustainability. When all the actors involved in the project organization worked together toward a common goal, many unnecessary debates and even quarrels were avoided. Building mutual trust between the actors helped them reach the full potential of their collaboration and avoid sub-optimization, thus contributing to the economic and environmental sustainability dimension of the project as well. In general, all the interviewees were very happy with the collaboration in the alliance model. An interviewee from the contractor company praised the alliance's collaborative spirit: "There's no fighting with the customer [in the alliance model], which is a rather remarkable and stressing part of traditional contracting. Here, the energy is allocated correctly and in a productive way without extra effort."

An important social issue in addition to the collaborative spirit among the alliance partners was the location of the tunnel site. With the construction taking place in the backyards of many inhabitants, some inhabitants were worried about the effects of blasting and drilling on their houses, and others were annoyed by the restrictions placed on boating on the nearby lake. Before the construction phase started, people were angry and hostile toward the project. However, as the project proceeded, they became interested in how the work was being done and how it would affect their daily lives. One interviewee highlighted the change in the atmosphere of the public hearings:

> "In the planning phase, the focus of the public hearings was basically on resisting the project. However, when the project then actually got under way, the nature of the events shifted

to genuine worries about and interest in the effects of the project."

According to the preliminary project plan, the alliance would help manage the project risks and better capture potential opportunities. The interviewees felt that this was the case. The project was ahead of schedule. The success was due to, among other things, the 76 innovations (potential opportunities) identified in the planning phase. Of these innovations, 39 were applied during the planning of the project, 20 were implemented during the construction phase, and only 17 were rejected. Having a common goal helped the alliance come up with innovative ways of working. Newspaper 1 stated, "Because we had a common goal, it brought many new aspects to the ways of treating risks, capturing opportunities and solving problems, the vice-project manager says."

These innovations and ideas saved money and speeded up the project, thus enhancing economic sustainability. As many of the ideas also had positive effects on the surroundings and those who live near the construction site (not just on the project budget and schedule), the collaborative process of decision making and idea creation promoted the sustainability of the project in all three dimensions. For example, one proposal in the preliminary project plan was to "dramatically reduce the disturbance experienced by the inhabitants." As the duration of the project was cut, it directly improved sustainability because every day that the construction was under way had negative impacts to the surrounding environment and the local inhabitants affected by the project. Table 3 summarizes the findings of the interviews and document data on how sustainability and sustainable project management were implemented in the tunnel project.

According to the interviewees, the alliance as the delivery model ensured that the full potential of all relevant contractors could be utilized, in the area of sustainability. In traditional delivery models, a contractor might be reluctant to innovate or put forward ideas, as they might not benefit the contractor. In addition, much sustainability-improving potential might not be fully utilized, and the contractor might not have access to specific information or the resources needed to realize ideas and proposals. In the alliance model, these problems were overcome by bringing the core project organization members around the same table and by binding the shared bonus system to common goals. The openness and transparency of the actions were found to be good on the customer side. Newspaper 1 reported:

> "According to the [director of the future owner of the tunnel], the alliance model is the best possible delivery model to carry out a construction project, as all invoices, subcontracts, and other payments run through the same bookkeeping. – No actor can take advantage of another. It is likely that we will achieve savings through this way of working, [the director] estimates."

However, the strong bonus system focus of the alliance model might also lead to sub-optimization when considering sustainability. Even with the two public organizations involved, the alliance was accused of not choosing the most environmentally-friendly solution in the tunnel's ventilation and exhaust gas cleaning because it was too expensive.

4.3. Control mechanisms for sustainable project management

The interviewees emphasized the importance of the financial incentive model of the alliance contract as a key control mechanism in sustainable project management. The interviewees described how the main goals of the project were included in the incentive model. A preliminary version of the incentive model was utilized by the project customer during the bidding phase of the project. This model included goals similar to those in the final incentive model and, therefore, enabled the customer to consider sustainability issues during the early phases of the project. When the main contractor for the project had been chosen, the final incentive model was developed in a collaborative manner within the alliance coalition. This

Table 3
Summary of sustainability and sustainable project management in the tunnel project.

Dimensions of sustainability	Economic	Environmental	Social
Evidence from the interviews	+ Costs were cut thanks to the alliance model, mainly because of the joint planning phase + Compensation model is likely to provide savings for each party + Multiple innovations in the planning phase and some in the execution phase	+ Dust-binding and noise-reducing work methods + Comprehensive environmental effects measurement + Environmental metrics are indirectly linked to the compensation model + Open discussions and joint development with environmental authorities	+ No fighting between the alliance actors + Collaborative spirit + Fast decision making through working side by side with the customer + Public hearings about the project + Public image of the project is a key result objective + Public project plan, transparency
Evidence from the documentation	+ Using local sub-contractors boosts the local economy + Cost savings were achieved through the alliance model − Alliance model and its bonus system can cause sub-optimization favoring the economic dimension of sustainability	− Small waste pile-up in the nearby lake − Decreased groundwater level + Follow-up of the vibration levels through continuous measurements, and before and after follow-ups	+ Strong presence in media throughout the project + Ahead of schedule − Political weapon − Many inhabitants opposed the project at first + The public atmosphere improved during the project (public hearings and media presence) + Public documents, e.g., project plan

collaboration made it easier for all the actors to commit to the project goals, including sustainability. Furthermore, all the various measurements and the key performance indicators (KPIs) of the financial incentive model were finally connected to the financial bonuses and sanctions. These bonuses and sanctions affected all members of the alliance coalition; therefore, the alliance coalition was motivated to implement sustainable project management collaboratively.

Table 4 summarizes key findings concerning the incentive model of the alliance contract and its role in sustainable project management. According to the interviewees' experiences and the project documentation, the incentive model takes into account all three dimensions of sustainability to some extent. The main focus is economic sustainability, to which all the components of the incentive system are connected. By promoting environmental sustainability and social sustainability, the alliance partners can also benefit in financial terms. This financial benefit was considered a motivation by the interviewees. Following the logic of the alliance contracts, the target values for the KPIs were set based on the typical good performance in the industry.

In addition to the financial incentive model of the alliance contract, the majority of the interviewees emphasized the role of project planning and the use of performance measures in controlling the progress of the project, including the achievement of the sustainability requirements. As described in Table 5, the interviewees shared an understanding that by building the sustainability issues into the different levels of project planning, the sustainability goals are achieved by "just implementing the plan" and "following up on a monthly/weekly basis."

The hierarchy of different plans was important in project control for sustainability. As Table 5 and Fig. 2 illustrate, the tunnel project was strongly influenced by national, regional, and municipality regulations that set constraints for the alliance organization and the case project. Naturally, a number of plans were written within the tunnel project; the more detailed lower-level plans built on the broader higher-level plans.

5. Discussion

In this study, we explored how a project organization used project control for sustainable project management in a road tunnel infrastructure delivery project. The case project is an example of a highly demanding project context in which the stakeholders are actively involved, and politics and regulatory requirements play a central role. Below, we discuss the responses to the research questions, in light of the empirical findings and previous research.

5.1. Implementing the three dimensions of sustainability in an infrastructure project

The first research question inquired how the project organization implemented the three sustainability dimensions in the infrastructure project. The empirical findings showed that the social dimension of sustainability in the case project was evident everywhere. The project was highly political, the inhabitants were first worried and then curious about the project, the alliance model eased interaction between the project actors, and safety and public image were key performance indicators. As the project location was very challenging in terms of the environmental effects, the environmental issues were highlighted through regulations and in the project plan and implemented through grass roots task and work instructions. The economic dimension of sustainability was linked to the bonuses and sanctions of the alliance model (i.e., the financial incentive model) and was strongly affected by actions for the environmental and social dimensions.

Among the key results in this study is the identification of dependencies between the environmental, social, and economic dimensions of sustainability, particularly in alliance projects

Table 4
The ways of using the incentive model of the alliance contract for project control in sustainable project management.

	Economic sustainability	Environmental sustainability	Social sustainability
Incentive model of the alliance contract	The alliance partners had commonly decided on a set of KPIs that formed a financial incentive model. The incentive model consisted of: 1) the target cost of the project, 2) the KPI set, and 3) exceptional incidents (and related bonuses and sanctions; e.g., decreased life-cycle costs (positive) or big accidents (negative)) The KPI set included four indicators: 1) schedule, 2) work safety, 3) usability of the tunnel, and 4) public image A financial incentive was based on the achievement of the KPI targets, increased/decreased by the achievement of the target cost and affected by exceptional incidents (positive or negative)		
	By delivering the project at less than the target cost, the alliance partners receive predefined shares of the cost savings. The achievement of the KPIs and positive incidences increases the bonus pool, paid in predefined shares to the alliance partners. The incentive model motivates the alliance partners to seek cost savings and promotes cost efficiency, thus promoting economic sustainability.	No environmental indicators were included in the KPI set. Poor consideration of environmental issues would probably have led to negative publicity (KPI 4), thus affecting the KPI set as well. Some environmental issues (e.g., soil transportation) were measured in the project budget, thus affecting the achievement of the target cost.	Two KPIs of the KPI set (work safety and public image) promote social sustainability. Work safety was measured with the accident rate and accident-related absences. Public safety was measured by evaluating the development and the nature of the media coverage of the case project.

Table 5
Other identified control mechanisms for sustainable project management.

	Economic sustainability	Environmental sustainability	Social sustainability
Planning	The interviewees emphasized heavily the importance of different levels of project planning. By including sustainability issues in different plans, the sustainability goals are achieved by following the plans. "To start from the beginning, the project plan is 'the bible.' We try to include all the things in the project plan as well as possible." "It is just that…we follow the goals [e.g., the incentive model] and plans [e.g., the project plan], and they result in sustainability—the plans and the goals are the rules, and by following them, sustainability will happen." "Well, yes, control is based on the project plan."		
Measurements and indicators	Target cost (budget) and schedule were measured as part of the incentive model. "We have a budget, which is followed on a monthly basis." "There are over 600 project cost accounts, to which costs are allocated."	Although no environmental indicators were included in the alliance KPI set, several other indicators were in place. The majority of the environmental indicators were boundary values. The majority of these indicators were based on city government regulation. "Of course, many environmental issues were measured [gives examples related to water, air, pollution, and vibration]."	Safety aspects and public image were measured as part of the incentive model.
Regulations	Many decisions in the project were based on or restricted by existing regulatory decisions, e.g., legislation and city planning. Compliance was required with at least 10 different sets of regulations.		
	N/A	"I don't even remember how many environmental permits we had to get. Approximately once a month, we had a meeting with the [environmental] authorities." "The authorities follow several environmental indicator values."	"The most important regulation is the allowed work time." "We were allowed to do noisy work from 7 a.m. to 10 p.m."
External communication	N/A	N/A	To promote a good public image, the construction company invested in external communication, particularly toward the municipality inhabitants. This included, for instance, a person responsible for answering stakeholders', especially inhabitants', worries and inquiries and organizing different information events.

with risk and benefit-sharing schemes. The balancing of the three dimensions supports previous research (Silvius and Schipper, 2014), but our findings contribute to the literature by showing how the alliance contract can enhance this balance. Previous researchers emphasized the environment dimension over the social and economic dimensions of sustainability (Drexhage and Murphy, 2010). The nature of social sustainability, in particular, is less well understood (Edum-Fotwe and Price, 2009). The findings in the present study indicate that certain project conditions increase the pressure to move the focus from environmental issues (which are more regulated and, thus, self-evidently implemented) to the social dimension of sustainability (which are not necessarily regulated but attract public attention), or at least to consider the two dimensions equivalent. In the case project, the central location in the city, publicity about the project, and the high number of stakeholders involved may have increased the importance of social sustainability. The findings also showed that as environmental and social issues were included in the shared incentive model of the alliance contract, all stakeholders had a financial incentive to carry out and manage the project in a sustainable way.

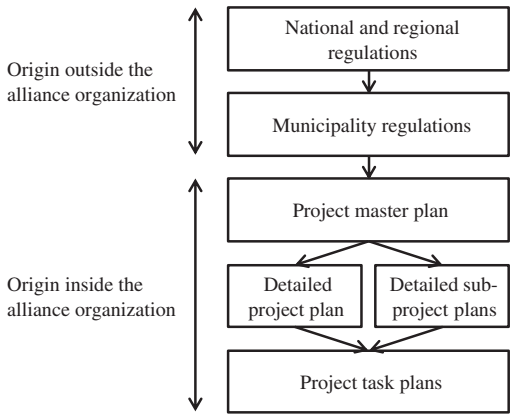

Fig. 2. Different levels of plans as guidelines for project control in the tunnel project.

This unique case also showed that the alliance model encouraged innovativeness in order to achieve mutual sustainability benefits and avoid risks. In the case project, innovations in the front end and during the execution phase of the project took an important position in achieving sustainability. The findings, thus, contribute to the previous research on value innovations in the front end of delivery projects (Kolltveit and Grønhaug, 2004) by showing that value innovations also take place regarding sustainability. We discuss these innovations more in a later section. We did not purposefully investigate sustainability-oriented innovations, but they emerged from the

data. Therefore, exploring their drivers and mechanisms further in future research would be interesting.

5.2. Sustainable project management in an infrastructure project through project control

The main goal of this research was to identify the control practices used by the project organization in implementing sustainable project management in an infrastructure project. To meet this main goal and answer the second research question, we identified various control mechanisms and their connections to the three dimensions of sustainability. We based our enquiries on a literature-based framework (Fig. 1), and a revised version based on the empirical findings is illustrated in Fig. 3.

Fig. 3 (and Tables 4 and 5) shows that different control mechanisms were identified related to the three dimensions of sustainability. The findings offer four main contributions regarding project control: They 1) show evidence of the control package in sustainable project management in an infrastructure delivery project, 2) map the use of different control mechanisms for the different dimensions of sustainability, 3) confirm the need to integrate sustainability into the ordinary project control routines (instead of developing separate routines), and 4) propose project sustainability governance as a novel avenue for research.

The results showed that the case project included a unique configuration of control mechanisms (i.e., a control package, cf. Malmi and Brown, 2008). In the project control literature, the plurality of different control modes and control mechanisms is a widely accepted phenomenon (Kirsch, 1997; Liu et al., 2014; Nieminen and Lehtonen, 2008). However, the literature on sustainable project management has focused mostly on the role of different performance indicators in controlling sustainability (Amiril et al., 2014; Fernández-Sánchez and Rodríguez-López, 2010; Haponava and Al-Jibouri, 2010; Shen et al., 2011; Ugwu et al., 2006). Performance indicators had a focal role in the case project, although the interviewees discussed several problematic issues related to the indicators, such as the lagging nature of some of the indicators (Williams et al., 2012) and issues in demonstrating a link between employee-level construction work and the indicators. Although project planning and performance measurement are typical diagnostic mechanisms of project control (Nieminen and Lehtonen, 2008), this study contributes to the literature by showing that the case project employed a wider range of different control mechanisms in controlling sustainability. The findings also showed that the mechanisms were clearly linked with each other, and particularly to the incentive model of the alliance contract.

The identified control mechanisms differed from each other in their origin: some mechanisms came from outside the project organization, whereas others were developed inside the project organization. A clear majority of previous research on both general organizational control and project control focuses on internal control, particularly control practiced by a director, a project manager or, as the main exception, a customer (e.g. Liu et al., 2014). The findings in the case infrastructure project revealed a control package involving control mechanisms from both within (internal control, e.g. project planning) and outside the project organization (external control, e.g. regulation). External control may offer new avenues for further research.

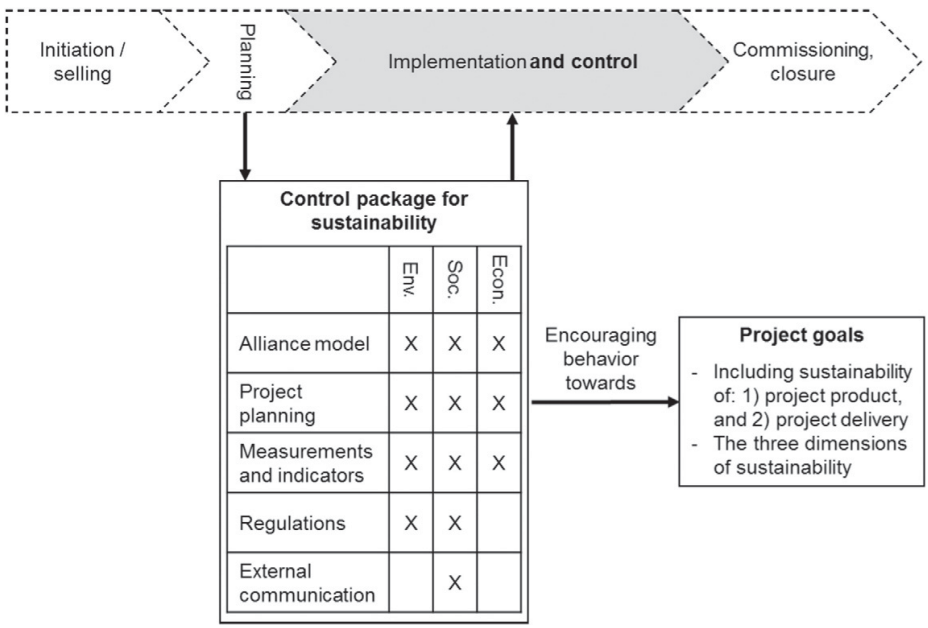

Fig. 3. Control package for managing sustainability during project implementation in the case project.

As an important contribution, this study has mapped how the project organization used the different control mechanisms to manage the three dimensions (i.e., economic, environmental, social) of sustainability (Tables 4 and 5). Where the alliance model, planning, and certain regulations were used to control all dimensions of sustainability, certain measures and indicators, certain regulations, and external relations were specific to each sustainability dimension separately. The results of this study demonstrate a division between the sustainable activities (Section 5.2) and project control of these activities (Section 5.3), and show tentative links between them, thus building on and lending support to Gareis et al.'s (2013) findings. The variety of mechanisms in the chosen project control package led to many of the sustainable activities. We anticipate that different projects need to consider their control packages individually, in line with the project's specific conditions (in line with Hobbs and Andersen, 2001).

The findings confirm the need to integrate sustainability into ordinary project control routines, thereby supporting the findings of a previous study (Gareis et al., 2013). In line with previous research (Hwang and Tan, 2012), the case project had few pure sustainability metrics; the majority of the sustainability indicators were built into the project's traditional control framework (particularly the financial incentive model and project planning). The findings suggest that sustainability can be added to existing tools and methods of project control and that project actors would prefer this approach, instead of adding separate sustainability-oriented control mechanisms. As the control mechanisms considered most important by the interviewees were not really sustainability-specific but were rooted in the general goals of the financial incentive model, general project control guided the alliance coalition to consider sustainability issues.

Where much of the previous literature on project control has focused on internal project control (e.g. Cardinal et al., 2010; Kirsch, 1997; Nieminen and Lehtonen, 2008), the present findings show a very clear link to external project control and, thus, suggest a need to explore sustainable project governance as well. The general control research has its roots in intra-organizational manager–subordinate relationships (e.g. Ouchi, 1979; Simons, 1994), as does the majority of project control research (e.g. Liu and Wang, 2016), particularly between a project manager and project team members. Where the literature review in this study emphasized that the stakeholders' views on sustainability and collaboration must be taken into account in projects and their goals (Abidin and Pasquire, 2007; Fernández-Sánchez and Rodríguez-López, 2010; Shen et al., 2007), the present study emphasizes the centrality of the alliance contract and regulations at the local, regional, and national levels as key aspects that influence project control. Findings in the case project showed that sustainability is clearly governed through environmental laws and regulations, the public voice has an important role in setting social sustainability requirements, and the incentive model of the contract guides the economic control and, through that, many aspects of the internal control package. As previous researchers have covered project governance in various ways (Ahola et al., 2013; Klakegg, 2009), we suggest that project sustainability governance should be explored more and modeled more clearly, and its context-specific requirements should be explicated, to guide sustainable project management in future projects. General frameworks of project control may need to be adjusted to account for sustainability sufficiently, and particularly in infrastructure projects involving multiple stakeholders and influenced by regulations, the frameworks need to be complemented with a comprehensive idea of sustainable project governance.

5.3. Alliance contract in supporting sustainable project management

As the contract form guides how project control is exercised during project execution, we explored the particular ways in which the alliance contract supports sustainable project management. As alliances have been studied in similar kinds of projects (Guo et al., 2014; van Marrewijk et al., 2008; Walker and Jacobsson, 2014), we particularly wanted to understand whether and how they can enable sustainable project management. Based on the findings, the alliance contract contributed to sustainable project management in two primary ways: 1) The contract enabled openness and encouraged innovativeness, and 2) the contract framed the entire control package through its incentive model and integrated different control mechanisms to guide the organizations toward the shared sustainability goals.

The interviewees emphasized how the alliance model enabled an open discussion among the different parties (in line with Silvius and Schipper, 2014), limiting the unnecessary "fighting" often present in traditional, more competitive contract models. The interviewees also perceived that decision making was quicker and easier. This was especially linked to environmental sustainability. Different permissions and approvals given by different authorities are a central aspect of ensuring environmental sustainability. The representatives of the private-sector contractor experienced that the participation of the city and the national transportation agency in the alliance made these discussions significantly easier. The findings, thus, lend support to previous research (Arts and Faith-Ell, 2012; Bond et al., 2012).

All the research data (interviews, media data, and document data) provided evidence of innovations in the case project, many of which were linked to the alliance contract. The innovations focused on all the dimensions of sustainability, particularly the target cost of the project and, thus, economic sustainability. Regarding the economic sustainability, two groups of innovations were identified: innovations at the front end of the project aimed at decreasing the target cost of the project and innovations during the execution phase of the project aimed at delivering the project under budget. Many interviewees even thought that the project would have been financially impossible to implement with a traditional contract model and without these innovations. The findings, thus, contribute by highlighting the role of innovations in achieving sustainability and by offering additional evidence to studies in other contexts (e.g. Lenferink et al., 2013; Wang et al., 2014).

The alliance contract in this case study took an integrative role regarding the variety of control mechanisms and toward the multiple stakeholders. As the findings showed, the incentive model in the alliance contract practically guided the entire control package, created guidelines for the primary control mechanisms, and offered a justification for everyone to work toward the shared sustainability goals. Thus, the findings offer evidence of a crucial link between sustainability governance and project control. The relational approach was central for the case project, in the front end and during the execution phase of the project (in line with Hobbs and Andersen, 2001). Although the main scope of the project was defined solely by the customer, many details were agreed on collaboratively within the alliance. Following Klakegg's (2009) terminology, the results of this study suggest that an alliance contract can be a potential way to make a project relevant and sustainable.

6. Conclusion

6.1. Theoretical contributions

This paper contributes to the discussion on sustainable project management, particularly in large infrastructure projects that have long-lasting effects on society. We showed evidence from a road tunnel construction project that took place in a central environmentally and socially sensitive context and had a significant influence on various stakeholders. Complementing the dominant indicator-centric view of sustainable project management, the findings show that a more holistic control package is used in sustainable project management, different control mechanisms are used differently for the different dimensions of sustainability, sustainability control needs to be integrated as part of general project management, and internal project control needs to be complemented with effective project sustainability governance. The findings follow the generally agreed idea of unique control packages in project control, but show the unique configuration of the control package in line with the project's sustainability goals. Where project control literature typically focuses on intra-organizational control or dyadic control relationships, the findings highlight the central role of external control — i.e. need for sustainability governance.

Through regulatory requirements and an alliance contract driving benefit and risk sharing, sustainability becomes the concern of not only the project team but also the project partners, thus enabling innovations and an integrated view of project control. Traditionally, PPPs and alliance as delivery models have been seen primarily as ways to manage uncertainty and control negative risks. The alliance as the project delivery model was shown in a positive light as a means to promote sustainability in a multi-partner setting, thus providing mutual benefits in addition to sharing of (negative) risks. The alliance contract provides a tool for public investors to promote broad stakeholder benefits and avoid the opportunism of single contractors, not just in monetary terms but also in terms of social and environmental issues. Large infrastructure projects involving multiple stakeholder interests are susceptible to public and political debate. This study provides a positive example of how the intense planning required in the alliance contract during the early phase of the project assisted in proactively resolving the public's social and environmental concerns and eventually promoting the project's economic success.

6.2. Managerial implications

This study proposes that the contract model selected in public investment projects partly or possibly largely governs the project's sustainability practices. Public investors can consider alliances as an alternative to traditional models of project contracting, as the alliance in this study proved to be very successful. In particular, public investors can use alliances as an integrative device to promote sustainability. Coordinating and understanding multiple stakeholder viewpoints is part of social sustainability. Managers need to understand that these viewpoints are as important as ecological issues that are the traditional focus when sustainability is considered. Our results suggest that the logic of controlling for the different dimensions of sustainability is somewhat different and driven by different factors (regulations, publicity, incentives). To complement and implement the alliance contract, managers need to create a holistic control package to manage the dimensions of sustainability. They also need to consider practices for project sustainability governance, as the involvement of key alliance partners, regulators and other stakeholders toward sustainability needs to be specified and agreed.

In addition to embedding sustainability in the contract and the performance indicators of the project, the present study has drawn attention to good sustainability-oriented plans, the customer's boundary control, and incentives. In large investments, intensive and collaborative planning is beneficial not only for the project's deliverables but also for enabling innovativeness and sustainable practices throughout the implementation of the project. Incentive models are an important part of alliance contracting. In the case project, their key content was specified together during the planning phase. The incentive model helped to promote sustainability throughout the implementation of the project. Incentive models with built-in sustainability could also be considered in other PPP models as a means of promoting sustainable practices.

6.3. Limitations and ideas for further research

This study is limited by the qualitative single-case design, as well as the method and data choices. We purposefully sought an exemplary case of an infrastructure project with clear sustainability challenges and requirements, and we have summarized its basic properties, to enhance the credibility of the findings. As such, however, single case findings cannot be generalized to infrastructure projects more generally, but the developed frameworks can assist further research and enable replication. As alliance models are new in infrastructure projects [in the target country], the results likely would be

somewhat different in areas where such alliances are more common.

The data collection methods are another limitation of the study. News documentation is limited by the media's choices, and the documentation does not necessarily describe all aspects of sustainability practice. The limited number of interviewees and the focus on manager-level experiences limit the findings, too. The employee level or a broader sample from different stakeholders might have revealed new issues concerning sustainable project management, or more subtle forms of control that were not clearly covered, such as certain aspects of informal and social control (Nieminen and Lehtonen, 2008). To improve the validity of the research, we used two complementary methods, a structured coding outline for the document data, knowledgeable key informants as interviewees, and a consistent interview outline for the interviews, and cross-checked between the different data sources.

As the pressure to manage projects sustainably will undeniably increase in the future, there is a need for further studies to find suitable practices to help companies manage their projects and evolving stakeholder networks in a sustainable manner. The limitations in the sampling suggest that further attention could be directed at the employee-level practices and experiences of sustainable project management, to verify and enrich the findings. Our findings called attention to sustainable project control as a holistic control package and showed evidence particularly for selected categories across the sustainability dimensions. Further research could map the use of control mechanisms for sustainability across different types of projects, and also investigate the possible drawbacks of sustainability control. In addition, the focus was on the triple bottom-line sustainability dimensions and control mechanisms related to those three dimensions. The control of other aspects of sustainability, such as stakeholder aspects and lifecycle thinking, could be on the focus of further research. The identified control package revealed a potential division into internal and external control, which could also be studied further.

As innovations emerged in an important role in framing the sustainability potential of the project, we suggested sustainability-oriented innovations and their drivers and mechanisms to be covered in future research. In addition, we pointed out the unique character of and further research needs concerning sustainable project governance, as regulations at various levels affect and cause requirements for infrastructure projects. The alliance model may be a possible answer for ensuring greater benefits to the broader public especially in multi-stakeholder projects. However, the division between the financial incentive model and the alliance contract remains partly blurry, which requires additional research, to analyze how sustainability-oriented incentive models could be built into other types of PPP models as well.

Conflict of interest

The authors declare that there are no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.ijproman.2017.02.009.

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Program integration in multi-project change programs: agency in integration practice

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Abstract

Multi-project change programs pursue challenging goals and may suffer from uncertainty and conflicting interests. To achieve their goals, such programs need integration both with the parent organization and between projects. There is a need for knowledge on how program actors implement integration. This study pursues new knowledge on program actors' agency in program integration in the context of multi-project change programs. Two case programs in different contexts were explored, to map their integration mechanisms and program actors' integration activities during the program lifecycle. The results reveal five integration tasks, the program-specific use of integration mechanisms, differences in the integration approach between the two programs, and the parent organization's input at the program front end in defining the program's requisite autonomy. The organization's maturity in project-based organizing, the program and project managers' competence, and the autonomy enabled at the program front end are shown to define the programs' integration practice.

Keywords: Change program; Integration; Program management

1. Introduction

1.1. Background

Through the widespread usage of projects, organizations face a need to manage entities consisting of multiple projects — i.e., programs — efficiently. Programs are designed to pursue common higher-order objectives (Turner and Müller, 2003), they may consist of multiple projects that are related to each other, and reaching the objectives of a program would not be possible by managing the projects independently (Lycett et al., 2004). Program management is needed to coordinate the program's projects as well as other change-oriented activities to deliver the strategic change for the organization (APM, 2012; Pellegrinelli, 2011).

A central characteristic of permanent organizations is the division of work between several units (subsystems) (Lawrence and Lorsch, 1967). In multi-project programs, a similar division of work occurs at three interfaces: 1) between a parent organization and a program, 2) between the projects within a program, and 3) within the projects of a program. To ensure that these subsystems work as a coherent, aligned unit, program integration (or program coordination Dietrich, 2006) is needed. Program integration is defined here as *the process of achieving unity of effort between the projects of a program and ensuring alignment between the program and the needs of the parent organization*. This study focuses on program integration in multi-project change programs.

To core idea of organizational integration is the utilization of different integration mechanisms to create unity of effort in the organization. Integration mechanisms are the practical — formal

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or informal — ways, in which integration is carried out. Whilst the literature on integration in permanent organizations dates back to the 1960s and project integration management — i.e., integration within projects — is a basic component of project management (e.g., APM, 2012; PMI, 2013), only a few empirical studies cover integration in multi-project programs. These studies have focused on either project-to-project integration (Dietrich, 2006), integration with the parent organization (Lehtonen and Martinsuo, 2009), or both (Turkulainen et al., 2015). The studies have followed different analytical perspectives to integration, such as boundary management (Lehtonen and Martinsuo, 2009) and information processing (Turkulainen et al., 2015), and focused on different types of programs, such as change programs (Dietrich, 2006; Lehtonen and Martinsuo, 2009) and a global operations expansion program (Turkulainen et al., 2015). This study is designed to complement this limited empirical research by focusing on both program-to-parent organization and project-to-project integration (following Turkulainen et al., 2015) and by applying the perspective of agency to integration.

Some research indicates that the pursuit of program goals requires not just integration mechanisms but also ways for the program actors to influence and "negotiate" their context (Näsänen and Vanharanta, 2016; Pellegrinelli, 2002) or negotiate the scope of their activities (Crawford et al., 2008). This stream of research implicitly suggests that program actors exercise *agency* for the parent organization, when carrying out the strategic change (Crawford et al., 2008; Näsänen and Vanharanta, 2016). Agency refers here to the purposeful actions of individuals, who reflect on the conditions of their activities and are able to transform those conditions (Näsänen and Vanharanta, 2016). Where earlier program management research has covered, for example, program manager competences (Miterev et al., 2016; Pellegrinelli, 2002), there is more generally a need to understand program actors as agents whose interests, needs and actions shape the way in which the program integration takes place and how the program performs its change task for the parent organization.

1.2. Research objective and scope

The objective of this study is to develop new knowledge on program actors' agency in program integration in the context of multi-project change programs. We seek understanding on program actors' interests and actions as part of program integration at two levels: program-to-parent organization and project-to-project integration. As earlier research has largely focused on the program integration mechanisms — what they are and how they appear in use — in different programs, we argue that program actors can use them differently and for different purposes in the different integration interfaces. Agency in the use of integration mechanisms, thereby, ties the integration mechanisms with the pursuit of the change goals. Therefore, understanding the agency perspective in using integration mechanisms will contribute by suggesting how a certain integration approach emerges and becomes (or sometimes fails to become) accepted as the way to guide the change toward its goals. The research focuses on two research questions:

1. What kind of integration mechanisms do program actors use in program-to-parent organization integration and project-to-project integration in organizational change programs?
2. How do program actors exercise their agency in program integration?

In this paper, we focus on change programs that intend to transform the parent organization and its processes and activities. We delimit the attention to organizational change programs which are also the dominating focus in previous program management research (Martinsuo and Hoverfält, 2018), even if program management can be applied in other contexts and program types as well. Change programs may feature subcontractors and partners, but our research is delimited to intra-organizational program integration, not the broader networks. The focus is on the agent's view, where program actors include program managers, project managers, project team members and steering group members. Our findings represent the perspective of the program actors; the direct experiences of the principal are left for further study, including the parent organization's sponsorship of the change, and the experiences of the employees affected by the change program. Our focus is on program-to-parent organization integration and project-to-project integration. Intra-project integration (i.e., project integration management) is purposely excluded.

The remainder of this paper is structured as follows. After this introduction, literature on programs and program management, integration in programs and agency in program integration is discussed. Then the design of the empirical study is described and the results of the empirical study are introduced. Finally, the results are discussed with respect to the existing literature on program management and program integration in particular.

2. Literature review

2.1. Multi-project change programs and program management

Projects are widely used to carry out organizational change and development efforts. The widespread use of projects has generated a need to organize projects in a more coherent way (Pellegrinelli, 1997). Programs can be considered as temporary organizations that group projects together and manage those projects as an entity, to reach specific benefits (OGC, 2007). Compared to projects, programs are often considered more uncertain (Pellegrinelli, 1997), ambiguous (Thiry, 2002) and benefit-oriented (Maylor et al., 2006). Program management refers to "*the application of knowledge, skills, and principles to a program to achieve the program objectives and to obtain benefits and control not available by managing program components individually*" (PMI, 2013).

In this study, the focus is on change programs. While there are different types of programs, a change program is mainly goal-oriented (Pellegrinelli, 1997) and vision-led (OGC, 2007) and attempts to transform the parent organization and its

business in a pre-defined manner. A program's projects may or may not exist prior to program launch and the degree of change may vary (Vereecke et al., 2003). In change programs all kinds of combinations of pre-existence and degree of change are possible. In this study, a change program is defined as *a collection of inter-connected projects and actions that are coordinated, managed and controlled in a strategic way to achieve a pre-defined change in the parent organization.*

A key aspect of a change program is the relationship between benefits, change vision, program goals and project objectives. The existing literature tends to use the terms "change vision", "goal" and "objective" interchangeably; in this study, the terms 'change vision' and 'goal' are used with respect to a program and the term 'objective' with respect to the projects within a program. The starting point is an overall change vision, which describes the change to be pursued by the program (Lycett et al., 2004). Building from the change vision, the general goals of the programs and the objectives of the projects are defined and refined in the early phases of the program and more detailed planning is done while the program proceeds towards execution (Ferns, 1991; Lycett et al., 2004; Pellegrinelli, 1997). In order for the change programs to fulfill their purpose, program goals and project objectives need to align with the parent organization's strategic priorities (Thiry, 2004a, 2002). Benefits management goes part of the way by emphasizing the alignment between project objectives, program goals and benefits for the parent organization (Breese, 2012; Breese et al., 2015). However, the clarity of goal setting achieved in the initiation phase and the nature of program initiation differs between programs (Martinsuo and Lehtonen, 2007), creating additional requirements for the effective management of programs (Crawford and Pollack, 2004).

When a program reaches the implementation phase, the clarity of its goals and expected benefits may vary. Also, programs are not stable but instead evolve during their lifecycle (Pellegrinelli, 1997). Due to the potential for ill-defined goals, benefit-orientation and evolving nature, we propose that uncertain and complex multi-project programs require different integration patterns than single projects, creating a need to study integration in the context of multi-project programs.

2.2. From organizational integration to program integration

The need for organizational integration stems from organizational fragmentation (Dietrich, 2006); i.e., the segmentation of organizations into various subsystems, each having its own responsibilities and tasks (Lawrence and Lorsch, 1967). Following this idea of organizational fragmentation, organizational integration can be defined as "*the process of achieving unity of effort among the various subsystems in the accomplishment of the organization's tasks*" (Lawrence and Lorsch, 1967). Sometimes the terms integration and coordination are used interchangeably (Dietrich, 2006). For example, Van De Ven et al. (1976) define coordination as "integrating or linking together different parts of an organization to accomplish a collective set of tasks". The discussion about the difference between coordination and integration is beyond the scope of this study, and the term integration is used.

Since the seminal organizational integration studies (Galbraith, 1973; Lawrence and Lorsch, 1967; Thompson, 1967; Van De Ven et al., 1976) the main focus of organizational integration literature has been on identifying different integration mechanisms (sometimes called integration techniques) and contextual factors to understand the different configurations of integration mechanisms applied in different organizations (Dietrich, 2006). Integration mechanisms are the practical ways — formal or informal — in which integration is carried out. Similar integration mechanisms are typically classified into groups (often called integration modes); among the most used classifications is the division into impersonal, personal and group mechanisms (Van De Ven et al., 1976). Examples of integration mechanisms include rules and written policies (impersonal), liaison roles and integrator roles (personal), and different teams and committees (group) (Turkulainen et al., 2015).

The research on organizational integration has focused primarily on permanent organizations. Regarding temporary organizations, several studies have discussed integration in single project environments. For example Dietrich (2007) reports an extensive summary of single-project related integration. The main results of these studies relate to the need for integration stemming from the division of work in projects into several tasks and between several teams (i.e., several subsystems). For example, inter-team integration has been argued to have a positive effect on team performance (Hoegl et al., 2004) and a variety of integration mechanisms are used for inter-team (Van Fenema, 2002) and inter-task integration (O'Sullivan, 2003).

Integration in multi-project programs, however, is covered in just a few studies. Aligning with the definition of organizational integration, in program integration the various subsystems (cf. Lawrence and Lorsch, 1967) refer to the projects of the program. In addition to integrating the work (achieving unity of effort) between the projects within the program, integration is also required between the program and the parent organization. Thus, in this study we define program integration as *the process of achieving unity of effort between the projects of a program and ensuring alignment between the program and the needs of the parent organization*.

Although some research suggests that project management techniques can also be useful in program management settings (Van Buuren et al., 2010; Görög, 2011; Pellegrinelli et al., 2015), integration in the context of change programs cannot only be considered in terms of task and project team integration (i.e., intra-project integration). Table 1 summarizes such earlier empirical research that has explicitly discussed program integration either in terms of program-to-parent organization integration, project-to-project integration, or both.

Dietrich (2006) studied program integration in four intra-organizational development programs. Dietrich identified different formal and informal integration mechanisms grouped into group, personal, and impersonal mechanisms. Additionally, Dietrich discussed the role of uncertainty and complexity in explaining the different configuration of integration

Table 1
Summary of previous empirical research on program-related integration.

Study	Context	Integration interface		Need for further research/research gap for this study
		Program-to-parent organization	Project-to-project	
Dietrich, 2006	– A multiple case study – Four intra-organizational development programs		X	– The results should be tested with a different set of change programs – No focus on program-to-parent organization integration
Lehtonen and Martinsuo, 2009	– A multiple case study – Two change programs	X		– The results should be tested with a different set of change programs – No focus on project-to-project integration
Turkulainen et al., 2015	– A single case study – A global expansion program	X	X	– Focus on an operations expansion program, not change programs. – Does not cover how integration in both interfaces is managed *in change programs*

mechanisms in different programs. Dietrich's focus was limited to project-to-project integration.

Lehtonen and Martinsuo (2009) focused on program-to-parent organization integration employing a boundary management viewpoint. Their empirical setting included two intra-organizational change programs. In line with the Dietrich's (2006) study, Lehtonen and Martinsuo identified different integration mechanisms, although they followed a different (more inductive) classification. One of the main findings was that integration mechanisms were not the only way to manage integration; boundary management and isolation activities were also used. Lehtonen and Martinsuo emphasized the importance of different organizational-level, program-level and individual-level factors in explaining the contextuality of integration in different programs.

Building on the two earlier studies, Turkulainen et al. (2015), took into account both program-to parent organization and project-to-project integration. In contrast to both Dietrich (2006) and Lehtonen and Martinsuo (2009), Turkulainen et al. focused on a global operations expansion program, rather than change or development programs. Turkulainen et al. identified a range of integration mechanisms in both integration interfaces, following the same group-personal-impersonal division used by Dietrich. One of the main findings of Turkulainen et al. related to the nature of integration in the two integration interfaces; in the project-to-project interface all three types of integration mechanisms were utilized, while integration in the program-to-parent organization interface relied mainly on impersonal integration.

The three existing studies on program integration have offered partial evidence on the use of different integration mechanisms in change programs. The results of Dietrich (2006) (project-to-project integration) and Lehtonen and Martinsuo (2009) (program-to-parent organization integration) were focused on a certain integration interface only, and are yet to be complemented with studies in different change program contexts and covering both integration interfaces. The study by Turkulainen et al. (2015) indicates that the investigation of integration mechanisms in both types of integration interfaces is needed for understanding the pursuit of the change goals as a whole. However, it needs to be supplemented with studies in a change program context. Based on these research gaps, there is a need to focus on both integration interfaces in the change program contexts. In addition, all of the existing studies put their main focus on the different integration mechanisms. It is important to explore the program actors who, through their agency in change programs, act both as integrators and targets of integration.

2.3. Agency in program integration and management

Agency theory focuses on to the interaction of agents and principals, and the interests and actions of the agent, to work on behalf of the principal (Eisenhardt, 1989). The idea is that the principal delegates work to be carried out by the agent, and attempts to control this work, to achieve expected benefits. Agency theory draws attention to differing interests of the parties, the uncertainties in their interaction, and the "contract" through which the agents' behaviors are governed (Eisenhardt, 1989). In change programs, program actors can be considered as the agent, and the parent organization owners, directors, and sponsors of the program are the principal, representing the "sponsors" of change more broadly. In this paper, the term "program actors" refers to the group of people taking part in program work regularly, including program managers, project managers, steering groups and project team members.

In agency theory, a key assumption is the existence of an agency problem — conflicting interests between the principal and the agent and costs of controlling the work of the agent — and a risk sharing problem — different risk propensities and preferred actions to manage risk between the principal and the agent (Eisenhardt, 1989). As change programs are the parent organization's strategic organizational initiatives and typically feature significant uncertainty, agency and risk sharing problems both can be considered as relevant. Previous program management research has scarcely covered agency — i.e., program actors' interests and actions in working toward the change goals.

Näsänen and Vanharanta (2016) focused on the members of a temporary program management group. Their study demonstrates how the members of the program management group used different discursive patterns in order to 1) isolate themselves from the parent organization, and 2) detach themselves from the responsibility for implementation. In another example, Crawford et al. (2008) studied the concept of sponsorship in projects and programs and identified the role

of a sponsor as a pivotal one, positioned between the parent organization (the principal) and the temporary organization (the agents). In a single project environment, Turner and Müller (2004) studied the relationship between a project owner and a project manager. In their study, the principal-agent relationship between the two actors caused difficulties such as conflict and tight control (instead of partnership and empowerment); communication and co-operation were suggested as means to reduce these problems.

As the examples above demonstrate, the concept of agency has been fruitfully employed in program management research. As program integration can be considered a parent organization's central way to govern the program and its progress we will specifically focus on program actors' agency in program integration.

3. Research methodology

3.1. Research design

We adopted a qualitative multiple-case research strategy, to investigate the programs actors' use of integration mechanisms and agency in program integration in different change programs. Qualitative case studies are considered especially suitable when the boundaries between the studied phenomenon and its context are not clear (Yin, 2009). The importance of the interplay between the phenomenon and its context is highly relevant in change programs taking place in different organizational contexts, and regarding program integration and agency.

Following the research aim, the studied cases were multi-project change programs. We searched for change programs that were completed or almost complete, successful programs that should have achieved their expected benefits, and programs somewhat similar in their focus on an organizational change but different in their context, content, results, and integration approach. Studying more than one case increases the generalizability of the results and decreases the problems caused by a unique case (Yin, 2009). The differences between the cases enabled cross-case comparison and, thereby, investigating the possible contextuality of program integration.

Two case programs were selected, from the results of our search of organizations that have undergone significant changes in the recent past. Both programs were considered successful in terms of delivering their expected benefits, but had been implemented in a different context, had different goals and a different program structure. The success of the programs was assessed through the benefit perceptions of the program actors because the organizations did not use formal numerical assessment criteria for program success. General information on the programs is presented in Table 2.

The first program, here labeled as DigProg, is from a large municipal public sector organization. DigProg aimed to digitalize internal work processes, introduce new IT-based tools for digitalization, and improve digital communication between the municipality and its inhabitants. The municipality was facing financial pressures, and therefore a group of change initiatives was initiated by the city council. One of the change initiatives was DigProg, a multi-project change program pursuing efficiency through digitalization.

The program included ten projects, each with a dedicated project manager. A program-level steering group was established to monitor the program's progress, and some of the projects had their own steering groups as well. In addition, program office meetings took place regularly. The program manager and the project managers participated in regular program office meetings.

In the interviews, it became evident that the projects of DigProg were quite different. The perceived clarity of the projects' objectives varied and this highlighted the need for integration. To clarify this aspect, two projects that demonstrate the dominating difference in the program's project types are

Table 2
Background information on the case change programs and interview data.

	DigProg	ProcessProg
Parent organization	A public sector municipality organization	A medium-sized private sector company
Change vision	Digitalize internal work processes and improve digital communication between the municipality and its inhabitants.	Develop new, less key person-dependent customer processes
Success of the program (perceived by the interviewees)	Relatively successful	Relatively successful
Clarity of the change vision (perceived by the interviewees)	Low: Vague, fuzzy and with different interpretations	High: Clear and coherently understood
Program structure	Steering group, program manager and program office, multiple projects, some project-level steering groups	Company management group as a steering group, program manager, multiple projects, no project-level steering groups
The status of the program	Case program had ended 2–3 years ago	Case program had just ended
Size of the program	10 projects	4 projects
Number of interviews conducted	8 one-to-one interviews, 2 group workshops	7 one-to-one interviews, 1 group workshop
Interviewees	1 program manager, 4 project managers, 1 steering group member, 1 project team member, 1 employee representative	1 program manager, 3 project managers, 1 sponsor, 2 project team members/employee representatives
Average interview length	64 min	52 min

Table 3
Example projects from DigProg.

	ClearProject	FuzzyProject
Project objectives	Build a new platform for digital communication and collaboration	Develop and introduce new processes and ways of working, especially utilizing digital tools and solutions
Clarity of the objectives (perceived by the interviewees)	High: the project team knew what they were doing and the objectives of the project were understood coherently throughout the project team	Low: the objectives of the project were considered unclear and fuzzy by the project team and different stakeholders had different ideas about the objectives of the project
Experience of the project team (perceived by the interviewees)	High: the project manager and most of the project team members had done similar tasks together multiple times	Low: the project team was small and neither the program manager, nor the project team members had adequate experience in the area

described in Table 3, and will be referred to in the subsequent sections. This kind of a phenomenon was not identified in the second case program.

The second program, here labeled as ProcessProg, took place in a medium-sized private sector company operating in a business-to-business market and offering its customers expert services. The main challenge for the company was the key-person dependency of its expert services: each specialist implemented customer projects individually and in a different manner. The management of the company considered the person-dependency both a risk (e.g., absences) and an obstacle for efficiency. Therefore, a change program was initiated with a goal to introduce team-based customer processes.

The program included four projects, each of which had its own project manager. The company did not implement any program-level or project-level steering groups as it was not considered necessary for a medium-sized firm with very limited resources. Instead, the progress of the program was discussed in the company's management group meetings. The project managers were also members of the management group.

3.2. Data collection

The empirical data were collected using semi-structured interviews. Altogether fifteen interviews were conducted (eight in DigProg and seven in ProcessProg). The interviewees were selected by a key informant in the program, to cover the case programs' core personnel. The interviewees are listed in Table 2.

The interview protocol focused on the integration practices and roles of the program actors in the different phases of the programs. The interviewees were asked to describe their actions and the actions of other key program actors throughout the lifecycle of the program. A semi-structured interview protocol enabled the interviewer to fine tune the interview structure based on the answers of the interviewee, but the same core interest areas were discussed with every interviewee. These core themes in the interview included:

- The role and background of the interviewee,
- The interviewee's general perceptions on the success of the program,
- The interviewee's descriptions about the actions of different program actors and significant events on his/her area of responsibility throughout the lifecycle of the program,
- The interviewee's descriptions about the interconnections, relationships, communication and collaboration throughout the lifecycle of the program between:
  - the several projects/project managers,
  - the program manager and the projects/project managers,
  - the parent organization and the program
- The interviewee's perceptions on the "pros and cons"/ 'lessons learnt" from the program

The interviews were recorded and fully transcribed. In addition to the interviews, results presentation sessions were organized in both organizations to present, discuss and validate initial findings. Secondary data such as program and project plans were also studied to deepen understanding on the case programs and to triangulate the data.

3.3. Data analysis

The transcribed interviews were systematically content coded. We read through the interviews first, to identify recurring themes and develop the coding scheme for inductive analysis. In the first coding phase, the focus was *on integration mechanisms*. All integration mechanisms were identified in the interview data inductively, but building on understanding from previous research regarding the impersonal, personal and group integration modes and the types of integration mechanisms within them. For example, various plans and rules (impersonal), project and program managers' liaison roles (personal), and meetings and committees (group) were coded. In this phase, all the integration mechanisms were marked regarding how they appeared in the two *integration interfaces*: program-to-parent organization and project-to-project integration.

When analyzing the identified integration mechanisms further, it became evident that integration mechanisms were used for several purposes that deal with defining and implementing the change. These purposes (i.e., change-related goals of integration) were inductively grouped into five *integration tasks* (Fig. 1), and the integration mechanisms used for each integration task were grouped similarly. This division into five integration tasks will be followed in the results section.

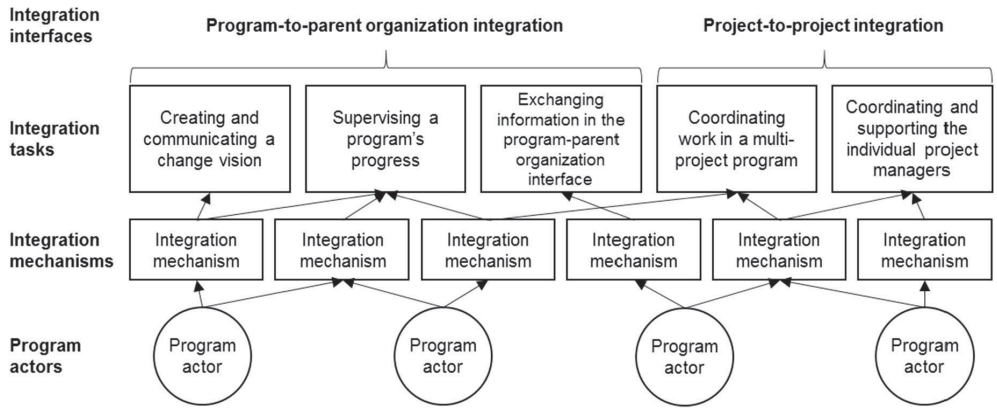

Fig. 1. Analysis framework for integration tasks and mechanisms.

In the second coding phase, we tracked *the program actors' activities* as part of the implemented integration mechanisms. The goal in this phase was to identify how the different program actors (program manager, project managers, steering group members, other project personnel, parent organization, and recipients of change) utilized and perceived the utilization of different integration mechanisms. This analysis revealed that program actors differ in their involvement and agency across integration tasks and in the use of integration mechanisms.

Finally, we cross-tabulated the key issues to highlight cross-case similarities and differences, both in program actors' activities and in their use of integration mechanisms. The results section is structured around the five integration tasks (Fig. 1), so that the program actors' exercise of agency in using the integration mechanisms is emphasized throughout. We use illustrative quotes throughout the text to highlight the main findings. The written quotations were anonymized to preserve the confidentiality of both the case programs and interviewees. Also the quotations were translated from the interviewee's native language to English. Some quotations were edited slightly to enhance their understandability and clarity, but their main content was retained.

The validity of the analysis was enhanced and verified in three main ways. Firstly, we sought for theoretical support and alignment for the constructs particularly concerning integration mechanisms from previous literature, to ensure the transferability of the results. Secondly, we utilized a consistent interview protocol and full interview transcripts to ensure the conformability of the results and the stability of the research process across cases, as described in the data collection chapter. Third, we tested preliminary findings in case-specific workshops and through additional discussions with the program managers, and had a chance to triangulate some of the data through program-related documentation, to verify the relevance and accuracy and credibility of the results. We have also explicated the purposive selection of organizational change programs as the research focus, which deals with the applicability of the results in other contexts. Remaining validity limitations are discussed in the conclusions section.

4. Results

The results section is divided into two main sections: program-to-parent organization integration and project-to-project integration. In both main sections, the practice of program integration is discussed following the division into the identified integration tasks in line with the developed framework (Fig. 1). The following subsections and their tables report results concerning both the different integration mechanisms (research question 1) and the activities of program actors and agency in program integration (research question 2).

4.1. Program-to-parent organization integration

4.1.1. Creating and communicating a change vision

An important component of each of the change program cases was the definition of the change by the parent organization (i.e., the change vision). At the program level, this change vision was then transformed into the goals of the program and the objectives of the projects. The integration mechanisms and program actors' activities in this integration task are summarized in Table 4.

In DigProg the change program was part of a broader change agenda of the municipality. From the perspective of integration, an important aspect was the broad and generic (not detailed) nature of the change vision communicated by the municipality council. Almost all of the interviewees described how the communicated change vision was just a broad idea about productivity through digitalization:

> "The vague change vision was communicated by the city council. It was just that 'we will digitalize everything'! No-one was defining what 'digitalization' would mean."

The broad and generic nature of the program-level change vision was mirrored by the less-detailed project objectives as well (refer back to Table 3). The respective project managers described how some projects had very clear objectives, while

Table 4
Program actors' activities and key integration mechanisms in the "creating and communicating a change vision" integration task.

Program actor	DigProg	ProcessProg
Parent organization	– The need for the change program originated from a municipality-level change vision. – The change vision was created and communicated by the decision making bodies of the city (e.g., city council) – The program actors did not participate in the creation of the municipality-level change vision. – The change vision was considered very vague by program actors. Key integration mechanisms: – The municipality-level change vision was communicated with formal documents.	– The parent organization was represented by the management group. – The management group was responsible for transforming the ideas of the to-be program manager into a change vision. – Importantly, majority of the to-be project managers were also members of the management group. Key integration mechanisms: – Management group workshops were used in clarifying the to-be program manager's ideas and transforming them into the program-level goals. – The workshops assisted in creating a common understanding.
Program manager	– Due to the vague nature of the municipality-level change vision, program manager (and the project managers) focused strongly on the creation of the program-level goals. Key integration mechanisms: – The main mechanism for this was the program office meetings. – These meetings (participated in by the program manager and the project managers) were used in clarifying the goals and objectives of the program and the projects.	– The to-be program manager was widely considered "the brains behind the whole idea." – In fact, many interviewees considered the program manager being visionary his main role (instead of coordination etc.). Key integration mechanisms: – The program manager facilitated the workshops, in which the general idea of the program manager was transformed into program's goals.
Project managers	– The project managers worked on defining the project objectives both independently and in the program office meetings. – The clarity and level of detail of project objectives varied significantly between projects. Key integration mechanisms: – Informal one-to-one discussions between the project managers and the program manager assisted in defining the project objectives.	– The project managers worked on defining the project objectives largely independently. – The project managers were responsible for transforming the program-level goals into the more practical objectives of the respective projects. Key integration mechanisms: – The majority of the project managers participated in the above-mentioned workshops. – Informal one-to-one discussions between the project managers and the program manager assisted in defining the project-level goals and in creating the common understanding.

the objectives of some other projects were defined quite poorly. As the project manager of FuzzyProject described:

> "There were no clarified objectives for my project. The top management had different expectations than the program and project personnel did. – There was just our project team and we could do whatever we wanted."

In ProcessProg the management had identified several challenges stemming from the old ways of working prompting the initiation of the change program. In particular, many of the company's processes were considered too person-related, which for example implied that the absence of key personnel caused major problems for the service. This problem was shared by the whole management group, and even more widely in the organization, but the "solutions" for the problem were mostly linked to a key manager. This person, the later-to-be program manager, was perceived as a visionary idea generator and the "brains behind" the change by most of the interviewees.

> "He [the later-to-be program manager] is that kind of a visionary person. He had a vision how this new concept could change the ways of working in our company."

In addition to the central role of the visionary manager in program-level goal setting, an important aspect was the creation and development of the change vision in the top management group. The visionary manager brought the general change vision into the top management group. This general change vision was then developed further in several workshop days.

When comparing the two programs, there were several differences in creating the change vision, under which the program-to-parent organization integration would take place. First, the change vision of DigProg had its roots in formal decision making, while the change vision of ProcessProg had a more informal origin. Second, the program key personnel participated a lot more in change vision creation and development in ProcessProg than in DigProg. That is, in ProcessProg the change vision was the result of several workshops, while in DigProg the change vision originated in the city council's decision making, completely externally to the program. Third, the level of detail and the level of shared understanding of the change vision were higher in ProcessProg than in DigProg.

4.1.2. Supervising a program's progress

In the "supervision of program progress" integration task, the focus was on monitoring and ensuring the progress of the program. As with the creation of a change vision, this integration

Table 5
Program actors' activities and key integration mechanisms in the "supervising the program's progress" integration task.

Program actor	DigProg	ProcessProg
Parent organization	– Different functions and decision making groups of the parent organization followed the progress of the program. Key integration mechanisms: – The parent organization's key managers followed the progress of the program in a few municipality-level meetings ○ The *supervising* role of the municipality-level bodies was considered limited.	– The management group had several meetings where they followed the progress of the program. Key integration mechanisms: – The management group discussed the progress of the program in a few meetings. ○ The *supervising* role of the management group meetings was considered limited.
Steering group	– A program-level steering group was set up to supervise and guide the program. Key integration mechanisms: – The program manager presented the progress of the program in regular meetings of the steering group. ○ Despite the regularity, the *supervising* role of the steering group was considered limited.	– The company's management group acted as the steering group.
Program manager	– The program manager reported program's progress to the steering group and in parent organization's other meetings. Key integration mechanisms: – The program manager presented the progress of the program in regular meetings of the program-level steering group and municipality level meetings.	– The program manager participated in the management group meetings.
Project managers	– Project managers assisted the program manager in evaluating the status of the program. Key integration mechanisms: – A common understanding of the progress of the program was created in the program office meetings.	– Project managers presented the progress of their projects in the management group meetings. Key integration mechanisms: – Majority of the project managers participated in the management group meetings.

task also took place both at the levels of the program and the projects. The integration mechanisms and program actors' activities in this integration task are summarized in Table 5.

In DigProg, the most important integration mechanism for program-to-parent organization supervision was the program-level steering group. Steering group meetings were organized regularly and included a report of the program progress delivered by the program manager. Based on the document data, such as program plans, this looked like a very textbook-like integration mechanism. In practice, however, both the program manager and the steering group members questioned the usefulness of this reporting. On one hand, the program manager felt that the feedback given by the steering group was quite limited. On the other hand, the steering group members questioned their abilities to evaluate the progress of the program with the reporting data provided by the program manager.

In addition to the steering group meetings, the program manager also participated in a few meetings of the municipality council and management and planning groups. Even more than the steering group meetings, the program manager perceived these meetings quite superficial and even useless for DigProg:

> "I presented DigProg in several meetings…but I received very little feedback [for the program] from those meetings."

In ProcessProg there were no separate steering group meetings. All the project managers were also members of the management group of the company and the progress of the program was discussed in the regular management group meetings. As one project manager explained:

> "We did not have a separate steering group or anything. We discussed the progress of the program as one topic in a few management group meetings"

There were both similarities and differences related to this integration task between the two programs. First, in DigProg supervisory program-to-parent organization integration was pursued through formal meetings and with multiple integration mechanisms, while in ProcessProg the nature of this integration task was more informal. Second, in both programs most of the interviewees considered the importance of the supervisory program-to-parent organization integration relatively low. Although a few supervisory program-to-parent organization integration mechanisms were identified, they were utilized quite seldom. Third, in DigProg there were several formal integration mechanisms in place for supervisory program-to-parent organization integration. However, according to most of the interviewees, these integration mechanisms were not perceived as fully functional.

Table 6
Program actors' activities and key integration mechanisms in the "exchanging information in the program-parent interface" integration task.

Program actor	DigProg	ProcessProg
Parent organization	– The different functions of the parent organization nominated representatives to project meetings. Key integration mechanisms: – The representatives participated in the project meetings, in order to ensure the consideration of the different functions' viewpoints.	– Middle managers and experienced employees were nominated to participate in project work. Key integration mechanisms: – Middle managers and experienced employees participated in project planning meetings. – In the meetings, the representative employees worked on the details of the new ways of working, together with the project managers.
Employees	– Employees were both a source of input (representativeness) and a target of actions (training). Key integration mechanisms: – Representation (see above). – Training about the new digital tools and ways of working were provided by the program personnel.	– Employees were both a source of input (pilot project and representativeness) and a target of actions (pilot project and new work instructions). Key integration mechanisms: – Representation (see above). – The new methods were tested in a pilot project. – Feedback from the pilot was collected when developing the new ways of working further.
Project managers	– In a few projects, project managers (together with project team members) were responsible for organizing training. Key integration mechanisms: – Training (see above).	– Project managers were in charge of creating the new work instructions. Key integration mechanisms: – Instructions and rules were created in the program, guiding the new ways of working.

4.1.3. Exchanging information in the program-parent interface

The last integration task in the program-to-parent organization interface is the exchange of information between the parent organization and the change program. This exchange of information took place in a bidirectional way, both from the parent organization to the change program and vice versa. The integration mechanisms and program actors' activities in this integration task are summarized in Table 6.

In both programs, the main way for collecting input from the parent organization was the use of employee representatives. For instance, when building a new communication platform in DigProg, the different municipal functions were represented, bringing their voice, needs and requirements to the planning work:

> "My job was to bring the viewpoint of our function to the project work. – And then I said: our function will not pay for that issue, we do not have any need for that."

In ProcessProg experienced key personnel and middle managers participated in project work, and middle managers collected feedback from the employees regarding the new ways of working. Although the project managers were experienced and very autonomous, the aforementioned people made up an unofficial project team, which planned the new ways of working to be designed by the projects.

Regarding transferring results from the program to the parent organization, the main mechanism in DigProg was training. For instance, in FuzzyProject the focus was on developing internal processes by introducing specific digital tools and solutions to the organization. In addition to introducing the tools and solutions, it quickly turned out that a lot of training was required to introduce the new ways of working to the parent organization as well. However, here the problems in creation of the change vision became apparent again. As the project manager of FuzzyProject explained:

> "The management was expecting those digital tools and solutions but all of the project personnel' time was used in training the municipality personnel."

In ProcessProg, the main mechanism for transferring results was the creation of work instructions. Previously, one of the main issues had been that similar work tasks had been done very differently by different employees. In the new ways of working they aimed to manage this issue by introducing more detailed instructions and rules for work tasks. From an integration perspective, the new work instructions acted as a way to transfer the results of the development work from the program back to the parent organization.

When comparing the two programs, this integration task appeared to be quite similar in both programs. In both programs employee representativeness was the main method for collecting input from the parent organization to the change program, and there was a mechanism in place to transfer the results of the program back to the parent organization.

4.2. Project-to-project integration

4.2.1. Coordinating work in a multi-project program

In both programs, coordination took place centrally for all the projects of the program. The integration mechanisms and program actors' activities for coordinating work are summarized in Table 7.

Table 7
Program actors' activities and key integration mechanisms in the "coordinating work in the multi-project program" integration task.

Program actor	DigProg	ProcessProg
Program manager	– The program manager led the program office meetings. Key integration mechanisms: – Program office meetings were the main mechanism for coordinating the project work. – In addition to the formal meeting itself, the importance of the informal nature of the meetings was emphasized even more.	– The program manager participated in the management group meetings. Key integration mechanisms: – In addition to program-to-parent organization integration, management group meetings acted as venues for project coordination as well. ○ The *coordinative* role of these meetings was not emphasized too much, though.
Project managers	– Project managers reported the status of their projects in program office meetings. – Project managers were expected to work relatively independently. Key integration mechanisms: – Project manager nominations affected the relationship between the program manager and the project managers. – An experienced project manager (and a project team) was selected for several projects (e.g., ClearProject). ○ The experience enabled the projects to proceed in an autonomous way. – On the other hand, in some projects (e.g., FuzzyProject) there was a lack of experience.	– Project managers reported the status of their projects in the management group meetings. – Project managers were expected to work relatively independently. Key integration mechanisms: – The nominated project managers were both experienced and held responsible positions (managers or similar) in their business areas. ○ The experience and responsible positions enabled the projects to proceed in an autonomous way. – Management group meetings (see above).

In DigProg, the main mechanisms for this integration task were program office meetings. These meetings brought together the program manager and the project managers. In the program office meetings, the project managers reported the progress of their projects and the potential problems or issues in the projects. In addition, the meetings acted as forums for preparing the program-level reporting for the steering group.

Despite the formal integration in the program office meetings, the importance of informal integration was emphasized by all the project managers and the program manager. In particular, the interviewees perceived the meetings as important places for the timing and coordination of project-to-project activities and interfaces, and as important forums for project-to-project discussion and problem solving. As an interviewee explained:

> "The program office meetings were more about communication, collaboration and timing of activities."

An important aspect related to the program office meetings was the projects' different levels of need for support. As a consequence of the challenges in project-level goal setting, the projects with less-well-defined goals (e.g. FuzzyProject) requested support much more often than the ones with a clear path forward (e.g. ClearProject). As the project manager of FuzzyProject explained:

> "There was a small project team, there were no clear goals, we were just allowed to mess around freely – So I started to ask for input more and more in those program office meetings."

In ProcessProg this integration task did not include any formal integration mechanism, except the management group meetings discussed already related to the program-to-parent organization integration. Instead, integration in this task relied mostly on the nomination of experienced project managers. The project managers' experience together with their responsible organizational positions enabled the project managers to lead their projects relatively autonomously.

4.2.2. Coordinating and supporting individual projects and project managers

In coordinating and supporting projects, integration efforts were put to the individual projects and individual project managers. Integration took place both "above" the projects (especially by the program manager) and "between" the projects. The integration mechanisms and program actors' activities in this integration task, including both subtasks, are summarized in Table 8.

In DigProg the interviewees particularly emphasized the program manager's tasks as a problem solver and as an authority; the program manager's authority was especially emphasized if a project manager was struggling to collaborate with external partners and suppliers. In addition, the program manager had clear coordinative tasks, as demonstrated in the program office meetings.

In ProcessProg the program manager's task as a discussion partner for the project manager was emphasized by multiple project managers. Although the program manager also spent some effort on schedule management, the interviewees primarily emphasized informal integration. This informal integration was especially related to the one-to-one discussions between the program manager and the project managers. One of the project managers explained:

> "We talked a lot about the program and the new ways of working [with the program manager]. They were essentially sessions for 'sparring' of ideas. How could we transform this change vision into practical ways of working?"

Table 8
Program actors' activities and key integration mechanisms in the "coordinating and supporting the individual projects and project managers" integration task.

Program actor	DigProg	ProcessProg
Program manager	– The program manager had several different tasks, with respect to the individual projects and project managers: ○ problem solving ○ being an authority (esp. external to the program) ○ coordinating activities ○ supporting projects and project managers in their work Key integration mechanisms: – Informal discussions took place both between the program manager and a project manager, and between project managers. ○ Discussions were initiated both by the program manager and by the project managers.	– The program manager had several different tasks, with respect to the individual projects and project managers: ○ coordinating activities (less emphasized) ○ being a discussion partner, in particular for "sparring" of ideas (more emphasized) Key integration mechanisms: – Informal discussions took place both between the program manager and a project manager, and between project managers. ○ Discussions were initiated both by the program manager and by the project managers.
Project manager	– Some project managers sought support from the program manager (and the program office meetings), while some others worked very autonomously. ○ The need for support was linked to the project manager's and project team's level of experience and the quality of project-level goal setting. Key integration mechanisms: – In addition to discussions with the program manager (see above), project managers discussed with each other, if there was a need for project-to-project coordination. ○ Project-to-project coordination was not really formally planned.	– Generally, the project managers worked independently. ○ Project managers sought for program manager's support, when they needed a discussant for idea 'sparring'. Key integration mechanisms: – In addition to discussions with the program manager (see above), project managers discussed with each other, if there was a need for project-to-project coordination. ○ Project-to-project coordination was not really formally planned.

When comparing the two program managers, the most important difference was related to the program manager's tasks of coordinating the project work. Although the interviewees, especially the project managers themselves, considered the projects relatively autonomous in both programs, in DigProg the program manager did more work coordinating the project work.

In ProcessProg there was no centralized coordination organized by the program manager. Individual communication between the program manager and the project managers took place irregularly but frequently, as demonstrated by the previous quotation. However, the individual communication between the program manager and the project managers was less about the program manager coordinating or supervising the progress of the projects, than about the program managers and the project managers pondering the next steps of the projects.

Another important aspect was the project managers' different levels of need for integration. This was again particularly evident in DigProg and linked to the different levels of detail and clarity in project-level goal setting and the different levels of project manager and project team experience. In addition to the need for support in program office meetings discussed earlier, FuzzyProject sought individual extra support from the program manager as well. Simultaneously, the more experienced project manager did not really think that support from the program office meetings or the program manager was really required. As the project manager explained:

> "I reported what we had done but was not expecting any feedback. We knew what we were doing; we had done similar things many times earlier."

Lastly, integration also took place between the projects in both program. The project-to-project integration was not planned or facilitated by the program manager in either program. The main exception was the program office meetings in DigProg, which also included elements of project-to-project integration. Instead of centrally planned or facilitated integration, it was up to the project managers themselves to seek project-to-project integration. As one of the project managers in DigProg exemplified:

> "The collaboration between me and the other project manager was not planned. We were just talking and it turned out that we were doing very similar things. And then we started to collaborate more closely."

The autonomy of projects was again evident in ProcessProg. There was some collaboration and communication between the project managers, but it was emphasized significantly less by the interviewees than in DigProg.

5. Discussion

5.1. Integration in multi-project change programs

The first research question inquired about the different kinds of mechanisms that program actors use in program-to-parent organization integration and project-to-project integration, particularly in organizational change programs.

Change programs are a way for organizations to coordinate various strategic change activities toward business benefits (Martinsuo and Hoverfält, 2018). Most of the existing literature on both organizational integration and program integration has

focused on the integration mechanisms with which integration is pursued (Dietrich, 2006; Lehtonen and Martinsuo, 2009; Turkulainen et al., 2015). Integration mechanisms and integration modes — e.g., impersonal, personal and group integration mechanisms (Van De Ven et al., 1976) — explain the practical *ways* for pursuing integration and this study lends support to previous research on the use of different integration mechanisms on the two integration interfaces. Our results complement this mechanism-centric view by discussing the *purposes* of integration and, thereby, the link of integration with the program's change-oriented goals. The division into five integration tasks reveals how program actors utilize similar integration mechanisms with different goals in mind, in order to pursue program integration and, consequently, the fulfillment of the change vision. For example, program office meetings (an integration mechanism in DigProg) were utilized in the "creating and communicating a change vision", "supervising a program's progress" and "coordinating work in a multi-project program" integration tasks.

The analysis of the integration mechanisms revealed the active use of several personal and group integration mechanisms in the change programs. The most emphasized examples include the program office meetings (DigProg), management group meetings and workshops (ProcessProg), and one-to-one discussions between project managers and between project managers and program managers (both programs). In line with these results, the previous studies (Dietrich, 2006; Lehtonen and Martinsuo, 2009; Turkulainen et al., 2015) have also identified different personal and group integration mechanisms in both integration interfaces.

Deviating from previous research, impersonal integration mechanisms were scarcely used in either of the case programs. In the only study having focused on both integration interfaces, the findings of Turkulainen et al. (2015) were the complete opposite: impersonal mechanisms were the only group of integration mechanisms used extensively in both integration interfaces. Two possible explanations can be provided for the scarce utilization of impersonal integration mechanisms in our study: organizational experience in project-based organizing and high level of project autonomy.

Projects are not the main method of organizing activities for either of the case organizations in this study. In comparison, the case company of Turkulainen et al. (2015) seems to be a lot more experienced in project-based organizing, exemplified for example by standard project reports, post-project evaluations and similar governance models for projects. It is possible that impersonal integration mechanisms are a feature of a more established project-based organization.

Another possible explanation for the low utilization of impersonal mechanisms relates to project autonomy. Project autonomy is a concept that has received increasing attention in single project research: it has been considered as a possible project success factor (Gemünden et al., 2005; Hoegl and Parboteeah, 2006) and studied in different contexts (Martinsuo et al., 2010; Martinsuo and Lehtonen, 2009). In both case programs, the level of autonomy was considered high by the program personnel, both at the level of the multi-project programs and the individual projects. When both a program and the projects of a program are allowed to progress relatively independently, there might not be much need for impersonal integration mechanisms in either integration interface.

The results of this study propose a difference between integration "on paper" and integration "in practice". Especially regarding DigProg, integration appeared different in the program documentation (i.e., 'on paper') than in the perceptions of the interviewed program personnel. A good example of this is the program-level steering group, which is a "textbook-like" integration mechanism in the program documentation, but was perceived as less useful by multiple interviewees. The division between integration 'on paper' and integration 'in practice' resembles the divisions between "established" vs. "unestablished" or "instructed" vs. "uninstructed" program management practice as reported by Martinsuo and Kantolahti (2009) in a single case program.

5.2. Agency in the integration practice of multi-project change programs

While the earlier studies (Dietrich, 2006; Lehtonen and Martinsuo, 2009; Turkulainen et al., 2015) have focused mainly

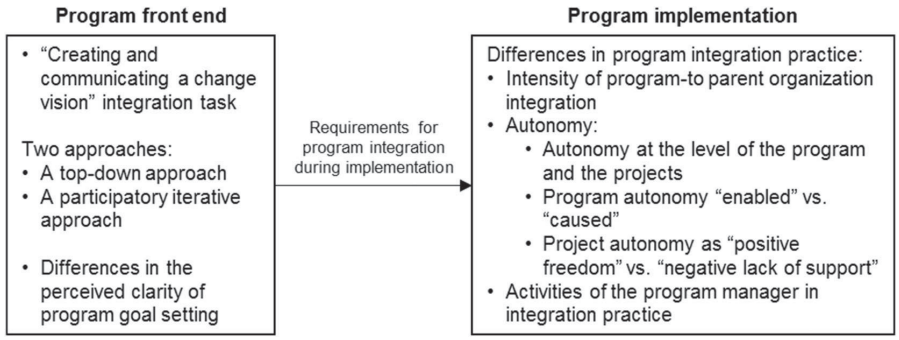

Fig. 2. Different agency phenomena in the integration practice based on the two-case study.

on the different integration mechanisms in the two integration interfaces, this study complements the mechanism-centric view by emphasizing an actor-centric view to integration practice. The second research question asked how different program actors exercise their agency in program integration.

This study reveals different dynamics in the principal-agent relationship in the integration practice of the two change programs and during their lifecycle (front end and implementation). The different agency phenomena are summarized in Fig. 2 and discussed next.

5.2.1. Agency at the program front end

In our results, the integration task "creating and communicating a change vision" plays a central role in the program front end, and the program actors exercised their agency in quite different ways. Our results contribute by revealing two different approaches to integration practice in the "creating and communicating a change vision" integration task: a top-down approach and a participatory iterative approach.

In DigProg, the municipality parent organization communicated a very vague change vision and let the program team take responsibility in transforming the change vision into the goals of the program. The change vision was created and the change program initiated by the municipality (principal) in a top-down manner (cf. Ferns, 1991) and the program actors (the agents) had very limited opportunities to participate in the creation of the change vision (cf. Martinsuo and Lehtonen, 2007). Multiple interviewees commented on the challenges of the vague and non-participatory goal setting; it, for example, turned out later that the parent organization and the program team had conflicting ideas about the goals of the program and, especially, the objectives of some projects. This example illustrates the challenge of uncertainty and ambiguity in the front end of change programs (Thiry, 2004a), mitigated in DigProg through the relatively high degree of autonomy taken and given by the "heavyweight" program manager and the creation of program-specific integration mechanisms.

Goal setting and program initiation in ProcessProg was almost a complete opposite to DigProg. In ProcessProg, much more work was done by the parent organization in defining the change vision and program goals before the initiation of the program. Both the program manager and almost all of the project managers participated in the ideation work that led to the creation of the change vision and initiation of the change program. When the change program was initiated, all the key personnel shared a relatively similar understanding on the goals of the program. Consequently, ProcessProg appeared to have an even lower need for program-to-parent organization integration later in the program than DigProg, projects had a rather high degree of autonomy, and the program manager primarily supported the project managers.

The discussion above illustrates how different approaches to defining and communicating a change vision can lead to different requirements for and approaches to program integration. This way our results echo the importance (Lehtonen and Martinsuo, 2008) and the challenging nature (Martinsuo and Lehtonen, 2007) of the program front end. In particular, the beginning of the front end can be considered as "fuzzy" in both case programs (cf. Thiry, 2002). However, our case evidence showed that program actors' agency was quite different: while in DigProg the creation of the change vision was a relatively efficient, rational and non-participatory decision-making process governed by the parent organization, in ProcessProg more effort was put in collaboratively creating clarity and decreasing the fuzziness already at the front end. This difference in the program front-end led to a change vision and program goals more coherently understood and shared by the program personnel in ProcessProg than in DigProg, requiring different integration approaches during program implementation from the program managers. While the participatory and sense making nature of program initiation (Thiry, 2004b) was considered as beneficial in ProcessProg, it can be perceived as vague, muddled and slow by program personnel as well (Martinsuo and Lehtonen, 2007), particularly if not supported with program actors' autonomy. Thus, the results suggest that program integration will require sufficient time and effort for the creation of a shared understanding, and this effort can be taken already at the program front-end or later during program implementation by a selective exercise of the program actors' agency.

5.2.2. Agency during program implementation

Despite the different approaches to integration practice at the programs' front end, the principal-agent relationship appeared as more similar across the two programs at the implementation phase. In particular, the parent organization's level of activity in the program implementation phase was generally low in both programs. In DigProg the parent organization implemented a few integration mechanisms (regular steering group meetings and a few other meetings), but the effects of the mechanisms were perceived as quite limited by the interviewees. The parent organization of ProcessProg interfered even less with the actions of the program team.

The parent organization's low activity in both case programs implies appropriate isolation and autonomy for the program, thereby supplementing previous research that has focused on how such isolation and autonomy is created in the front end (Lehtonen and Martinsuo, 2009, 2008) and how autonomy appears in single projects (Gemünden et al., 2005; Hoegl and Parboteeah, 2006; Lehtonen and Martinsuo, 2009). The results of this study illustrate two quite different viewpoints to program autonomy: program autonomy *caused* by a vague change vision and partially ineffective program-to-parent organization integration mechanisms (DigProg), and program autonomy *enabled* by a participatory approach to the definition of the change vision and the nomination of experienced program personnel (ProcessProg). In ProcessProg, almost all of the project managers were also the heads or top managers of the respective business areas representing the change recipient, thereby reducing the agency problem of conflicting interests.

Previous research has suggested that project autonomy does not take place automatically, but instead autonomy has to be "taken and used" and "given or withdrawn" (Martinsuo et al., 2010). This study (in particular in DigProg) shows two opposite viewpoints to autonomy expressed by different projects: project

autonomy was experienced both as "positive freedom" (in ClearProject) and "negative lack of support" (in FuzzyProject). Although project autonomy has been considered as a potential project success factor (Gemünden et al., 2005; Hoegl and Parboteeah, 2006), our results demonstrate a need for program managers to take into account the projects' different requirements or expectations for autonomy even within the same program.

5.2.3. Agency in program integration practice

This study was built on the premise that in change programs the parent organization as the principal and the program actors as the agent may have conflicting interests and actions to respond to uncertainty and that they use various mechanisms to align their interests. The results of this study reveal how the parent organization set up a few different structures to supervise the work of the program team (in particular in DigProg) and used its existing structures for the same purpose (in particular in ProcessProg). Despite these integrative, formal structures, the level of integrative activity at the program-to-parent organization interface was considered as low in both programs. The contrast compared to a more experienced project-based organization (Turkulainen et al., 2015) suggests that impersonal integration structures and systems may become more relevant over time, as the organization advances in project-based organizing.

Where previous research has emphasized the discursive strategies of program teams in isolating the program from the parent organization (Näsänen and Vanharanta, 2016), our findings emphasize the importance of how the parent organization selects and nominates program actors. The results indicate that both the selection of the program manager and the selection of the project managers played a pivotal role in how they were able to deal with the autonomy given — with purpose or not — to the program and to the projects. The findings have also confirmed the centrality of the program front end in specifying the required degree and style of integration (Lehtonen and Martinsuo, 2009; Martinsuo and Lehtonen, 2007): in both programs, the parent organization was more active in the front end of the program, and let the program team act relatively autonomously in the implementation phase.

The program actors most discussed by the interviewees were the two program managers as the key representatives of the agent. The central role of the program managers in the case programs was increased by the relatively low activity of the parent organizations in guiding, controlling, and monitoring the implementation phase of both programs. Both the academic literature and the textbooks, guidelines, and standards of project management and program management have traditionally emphasized the importance of planning, control, and coordination by project managers and program managers. Complementing such emphases, our results demonstrate some activities that have received less attention, such as the program manager acting as a support person and a discussant for the individual project managers, and having a championing or visionary role when creating the change vision for a change program and the respective projects. Earlier literature on program managers' competences (Partington et al., 2005; Pellegrinelli, 2008, 2002) has particularly emphasized the competence distinctions between project managers and program managers. Miterev et al. (2016) identified different program management competence profiles for different types of programs.

To conclude, the results of our study relate to the contextuality of program management. It is widely accepted that different projects (Shenhar, 2001) and programs (Martinsuo and Hoverfält, 2018) should be managed differently. This study contributes by emphasizing the need to tailor program management not only *between*, but also *within* programs, an important addition pointed out by Miterev et al. (2016) as well.

6. Conclusions

6.1. Theoretical contribution

Projects and programs are ways for organizations to deliver value (Thiry, 2002; Winter and Szczepanek, 2008), implement strategy (Lycett et al., 2004; Thiry, 2004a) and carry out organizational changes (Martinsuo and Hoverfält, 2018). Despite its benefits, program management has been argued to be inflexible in the context of an evolving strategy and to lack effective cooperation between projects (Lycett et al., 2004). By pursuing the unity of effort and strategic alignment, program integration is a means to achieve flexibility and inter-project cooperation, and for promoting project and program success. This study has contributed to program management literature by offering evidence on the program actors' different ways to exercise agency in the practice of program integration.

This study explored program integration on two levels: program-to-parent organization and project-to-project integration. The study has complemented the existing research (Dietrich, 2006; Lehtonen and Martinsuo, 2009; Turkulainen et al., 2015) by replicating some findings of earlier studies — in particular the utilization of personal and group integration mechanisms — in a different change program context. This study has also contributed to the emerging discussion on agency in projects and programs (Crawford et al., 2008; Näsänen and Vanharanta, 2016; Turner and Müller, 2004) by connecting the integration mechanisms and tasks with the actors' specific activities and agency in implementing organizational change. The results included the identification of five integration tasks through which program actors implement integration and pursue change goals, and the varying use of integration mechanisms for these different integration tasks. Organizational maturity in project-based organizing, selection of program and project managers, and program and project autonomy were revealed as likely explanations for the chosen integration mechanisms, specifically for the scarce utilization of impersonal integration mechanisms.

The findings showed different dynamics in the practice of program integration at the different lifecycle phases of the change programs (see also Martinsuo and Hoverfält, 2018). We identified two contrasting approaches — a top-down approach and a participatory iterative approach — in the creation and communication of a program change vision at the program front end. While the results support previous research in

generally emphasizing the centrality of the early phase of change programs (e.g., Lehtonen and Martinsuo, 2008; Martinsuo and Lehtonen, 2007), they contribute specifically by revealing the consequences of the two different front end approaches, indicating that the integration approach used in the program front end guides the requirements for integration during program implementation.

The research offers new knowledge on program actors' agency (Näsänen and Vanharanta, 2016) in program integration in the context of multi-project change programs. When the parent organization specifies the change vision for the program, it also specifies the requisite autonomy for the program manager. We showed that the case programs differed very clearly in their requisite autonomy, through the clarity in the program goals and personnel involvement in their setting. In this study, autonomy was enabled on both the program and project levels by the nomination of experienced people, clarity of goals and objectives, and the usefulness of program-level integration mechanisms. The existence or nonexistence of these factors led to autonomy being perceived either as positive and motivating freedom or as negative lack of support. While showing the enabling role of the parent organizations in the program front end, the study pointed out program managers in a central agency role during program implementation, both at the boundaries of programs and internal to programs. Program managers' typical activities of coordinating, controlling and planning were complemented by internal support, and visionary idea creation (cf. Miterev et al., 2016), thereby promoting and also differentiating the autonomy given to the program's projects.

6.2. Managerial implications

The results of the study deliver implications for program managers and other program professionals. The results emphasize the contingency view of program management (e.g., Martinsuo and Hoverfält, 2018; Miterev et al., 2016; Shao, 2018): organizations and program managers should tailor their program management approaches not just *between*, but *also within programs*. That is, program managers should not treat all projects within a program equally; they should acknowledge the different expectations and needs of different projects, project managers and project personnel. The results emphasize the importance of the front end phases of change programs (in line with Lehtonen and Martinsuo, 2008; Martinsuo and Lehtonen, 2007). In particular, organizations should focus heavily on the creation, clarification, and communication of the program's change vision and the respective goals of the program and the objectives of the projects. Also, the choices of key program personnel are crucial: when expecting high degrees of autonomy from the program and its projects, managers should have sufficient previous experience to be able to work autonomously, whereas less experienced managers would need more support from the parent organization.

The results show that the program manager is not just a coordinator of multiple projects. In addition, or even instead, the program manager can act as an internal support person or a visionary idea generator. Therefore, we encourage organizations to ensure that the official requirements for program manager duties would be defined in line with the varied expectations for creative and strategic thinking (front end), for project coordination and monitoring (implementation, traditionally emphasized), and for supporting the individual project managers (implementation, traditionally less emphasized).

6.3. Limitations and ideas for future research

The main limitation of the study relates to its methodological setting. The number of case programs can limit the generalizability of results. Although the use of two cases reduce the contextual influence of a single case, two programs is still a limited setting, and the choice of the cases has influenced the results. We have described our justification for the choice and the background information on the cases to increase the validity. Semi-structured, retrospective interviews as the main method of data collection also creates validity limitations, in terms of the selection of informants and their potential biases. To reduce validity problems, we have included a range of personnel groups within the program team, used a consistent interview protocol, and reported the data collection and analysis procedures thoroughly, to enable later replication. Furthermore, the research was not purposively designed with actors' agency in mind, as we developed the idea inductively after the data collection. This may have an effect on the validity of the research.

Due to the scarce existing literature and the limited number of case programs in this study, further program integration studies should be conducted with different programs in different contexts. The findings of this study and the existing studies on program integration should be tested in a quantitative research setting. The viewpoint of agency and program actors should be studied further with a focus on different aspects of program management, including program integration. The competence requirements and knowledge areas of program managers should be studied further, particularly covering their boundary spanning activities. This should include both in-depth qualitative studies in different program contexts and quantitative studies testing the findings of the existing research.

Conflict of interest

There is no conflict of interest.

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PUBLICATION III

Lifecycle view of managing different changes in projects

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Lifecycle view of managing different changes in projects

Purpose
A project contractor can promote the success of a delivery project by planning the project well and following a project management methodology. However, various changes typically take place, requiring changes to the project plan and actions that deviate from the firm's established project management methodology. This paper explores different types of changes and change management activities over the lifecycle of delivery projects.

Design/methodology/approach
A qualitative single case study design was used. Seventeen semi-structured interviews were carried out during a delivery project in a medium-sized engineering company that delivers complex systems to industrial customers.

Findings
Both plan-related changes and deviations from the project management methodology were mapped throughout the project lifecycle. Various internal and external sources of change were identified. An illustrative example of the interconnectedness of the changes reveals the potential escalation of changes over the project lifecycle. Managers and project personnel engage in different change management activities and improvisation to create alternative paths, re-plan, catch up, and optimize project performance after changes.

Research limitations/implications
The empirical study is limited to a single-case study setting and a single industry. The findings draw attention to the interconnectedness and potential escalation effect of changes over the lifecycle of the project, and the need for integrated change management and improvisation actions.

Practical implications
Efficient change management and improvisation at the early phase of a delivery project can mitigate potentially negative change incidents in later project phases. Changes are not only the project manager's concern; project personnel's skilled change responses are also helpful. The findings emphasize the importance of the project customer as a source of changes in delivery projects, meaning that customer relationship management throughout the project lifecycle is needed for successful change management.

Originality/value
The study offers increased understanding of changes and change management throughout the project lifecycle. The results show evidence of plan-related and methodology-related changes and their interconnections, thereby proposing a lifecycle view of integrated change management and improvisation in projects.

Keywords: Change management; Delivery project; Improvisation; Project lifecycle

Classification: Research paper

Introduction

With delivery projects, a project contractor fulfills a customer's need by delivering a customer-specific solution in the form of goods (tangible), services (intangible), or a combination of the two (i.e., integrated solutions; Brady et al., 2005). For both the contractor and the customer, it is essential that the delivery of these solutions is managed successfully. To promote the success of delivery projects, the supplier company can plan the project well and follow a project management methodology (PMM), both of which have been argued to promote project performance (Lehtonen and Martinsuo, 2006). However, projects rarely proceed exactly to plan or adhere precisely to set methodologies; instead, various changes take place throughout the project lifecycle to adjust the progress of the project in light of new knowledge (Klein et al., 2015). There can be both changes to the original project plans and deviations from the PMM. These changes have to be managed in order for the delivery project to succeed. This paper focuses on different types of changes and change management that occur throughout the lifecycle of delivery projects.

Previous research on changes and change management in delivery projects has particularly focused on the different reasons for changes to occur (Butt et al., 2016; Dvir and Lechler, 2004; Zhang, 2013) and the different tactics used to manage them (Steffens et al., 2007; Whyte et al., 2016; Zhang, 2013). The research on changes and change management typically covers the changes that are needed and made as compared to the original project plan. Literature on improvisation in projects, in turn, deals with the adjustments made in comparison to the PMM. The idea behind improvisation is that, despite the PMMs or formal tools available in the focal firm, project managers often act intuitively, based on their experience and the problem at hand

(Klein et al., 2015). The literature on improvisation in projects is interested in the sources, nature, and effects of these intuitive actions in projects.

Despite the relatively active research on change management in projects and improvisation in general, there are several research gaps that this study has been designed to fill. First, there is a need to better understand the nature of the different changes that occur in different phases of the project lifecycle (e.g., Dvir and Lechler, 2004; Zhang, 2013). In particular, there is a need to account for the whole project lifecycle and for both plan-related changes and deviations from the PMM. Second, there is a need for further empirical research covering improvisation in projects, particularly in complex delivery projects (Leybourne and Kennedy, 2015). Third, there is a need to better understand the roles of different stakeholders, both in change management and in improvisation (Aaltonen et al., 2010; Butt et al., 2016; Tukiainen et al., 2010; Zhang, 2013); for instance, what are the internal and external sources of change and what are the roles of different project actors in interpreting and responding to the changes.

The purpose of this study is to explore the different types of changes that occur during a complex delivery project, the sources of such changes, and project personnel's experiences with managing them. The focus is on engineering solution delivery projects that solve the same business problem (and can therefore be repeated for different customers), but need to be carefully tailored to the customer's processes during the design and implementation phases. The goal is to map the emergence of different types of changes over the lifecycle of a delivery project, and thereby identify the means to promote effective change management. This paper focuses on two main research questions:

1. What kinds of changes do project personnel experience during the project lifecycle, including: a) changes to the project plan; and b) deviations from the PMM, and what are the origins of the changes?
2. How do project personnel and managers implement change management and improvisation actions in the different phases of the project lifecycle?

The empirical study is delimited to engineering solution delivery projects that were designed by the focal firm and tailored and delivered to different customers globally. Therefore, organization development, product development, and information system delivery projects are not covered. However, as the existing literature on change management and improvisation is somewhat limited, literature examining topics beyond delivery projects is included.

Next, we analyze the previous literature on change management and improvisation, and how empirical studies have covered the issues recently. Then, the qualitative single-case methodology is introduced by explaining the research context, data collection, and analysis procedures. Results are introduced on the types of changes faced by the case company, as well as its experiences with managing them. We discuss the results in terms of the different changes and different reasons behind the changes throughout a project's lifecycle, and the different change management and improvisational actions related to those changes.

Literature review

Delivery projects as the implementation of a planned process

Delivery projects are a way for a project contractor to solve a customer's problem by delivering a customer-specific solution. Project management research with a focus on (industrial) delivery projects has traditionally taken planning-centric, normative, and deterministic perspectives

(Leybourne, 2017). The idea has been to identify the needs of the customer, plan a project to meet these needs, and control the implementation of the project by following the project plan. A similar planning-centric approach is emphasized by the influential standards and books of knowledge produced by various project management associations (such as APM, 2012; PMI, 2013).

More recently, the adequacy of the planning-centric and deterministic approach to project management has been questioned. Specifically, the uncertainty of projects limits the possibilities of relying heavily on project planning alone (Perminova et al., 2008). Because of uncertainty, it can be difficult to perfectly identify the customer's needs from the front-end of the delivery project, for example, and to include them in the project plan. Similarly, unexpected positive or negative events can occur during the planning and design work phases, thus requiring a change to be made to the project plan. Osipova and Eriksson (2013) argue that uncertainty calls for a flexible (organic) approach rather than a control-centric (mechanistic) approach to project management.

Few projects proceed fully in line with their specific plans, and changes need to be made and managed during their lifecycle (Dvir and Lechler, 2004; Steffens et al., 2007). Similarly, it has been noticed that project managers do not necessarily follow the organization's project management methodology, but instead improvise or adjust their practices and thereby deviate from the project management methodology in order to match the practice to the specific situation (Leybourne and Sadler-Smith, 2006). Both types of changes can take place within projects, and these form the focus of the study.

Changes and change management in delivery projects

In this paper, we acknowledge that various types of changes may take place during a project. Previous research has predominantly focused on reactive changes to the goals or the plan of the project, and their management (e.g., Dvir and Lechler, 2004; Steffens et al., 2007). Some studies adopt a broader perspective on deviations — not only those that deal with the official goals and plans, but also planned actions. Deviations concern "situations, regardless of consequence — positive or negative, large or small — that deviate from any plan in the project" (Hällgren and Maaninen-Olsson, 2005); however, not all deviations require change management.

Changes in delivery projects may take place for various reasons (Butt et al., 2016). For example, customers may request changes, the project team may come up with new or better ideas, or managers may require novel solutions later on in the project (Dvir and Lechler, 2004). Some of the problems and consequent changes in projects take place because of faulty or biased assessments and decisions made during project planning (Pinto, 2013). Furthermore, the project owners' assumptions about the future may be wrong (Zhang, 2013), or events that take place in the environment may alter stakeholders' expectations or affect the ways in which certain decisions manifest in practice (Aaltonen et al., 2010; Zhang, 2013). All of the previous examples demonstrate how changes occur for various reasons and why change management is required throughout the lifecycle of delivery projects; however, more research on this topic is needed (e.g., Dvir and Lechler, 2004; Zhang, 2013).

Successfully leading a project requires change control and risk management during its execution (Pinto, 2013). Various aspects of change management and control have been covered in earlier research. For example, configuration management is a relevant change management tactic when the changes deal with the project's deliverable (Whyte et al., 2016). The lifecycle of the project

has been pointed out to require coordination across functions and iteration over the project phases (Zhang, 2013). Some studies concern the ways in which project managers and personnel cope with unexpected events that occur as a result of stakeholder involvement in the projects (Aaltonen et al., 2010; Tukiainen et al., 2010). Using data and information on the asset (i.e., the project deliverable) is also needed (Whyte et al., 2016). Communicating changes to stakeholders is key to keeping them engaged and promoting a positive project culture (Butt et al., 2016). Many such studies indicate that there is a need for managing and coordinating the changes and that project personnel need to consider the broader implications for the stakeholder network. Previous empirical studies have covered relevant aspects of changes and change management in the context of various types of projects — specifically delivery projects. Table 1 summarizes an analysis of the key contributions from empirical studies closely linked with this research and points out the research opportunities and gaps justifying further research.

*** TABLE 1 TO BE ADDED HERE ***

Table 1. Examples of empirical studies on changes and change management in projects and their contribution to this research

The existing research summarized in Table 1 raises three main issues that drive this research effort. First, flexibility is needed in all the project phases (front-end, planning, execution, and delivery/commissioning) (e.g., Olsson, 2006). As the benefits of front-end planning may be lost through changes made during project execution, there is a need to study the changes and change management over the lifecycles of projects further (e.g., Dvir and Lechler, 2004; Zhang, 2013) in order to understand the emergence and consequences of changes, and also to learn from them for the sake of forthcoming projects (Wu et al., 2005). Second, previous research has pointed out the

centrality of external stakeholders, particularly in the context of delivery projects (Aaltonen et al., 2010; Butt et al., 2016; Tukiainen et al., 2010; Zhang, 2013). As stakeholder relations are characterized by unexpected events causing changes, there is a need to be clearer on the sources of changes, whether they are internal or external, and how these are experienced and managed in delivery projects. Third, there are indications that different types of changes need to be managed differently (Steffens et al., 2007), and that the measures concerning change need further development (Dvir and Lechler, 2004). These previous suggestions indicate that there is space for further in-depth studies about different types of changes, and their identification and description in different contexts.

Improvisation and adjustment in project management methodologies

Organizations often follow project management methodologies (PMMs) to their project-based operations. These methodologies can be based on the standard project models and methodologies of the professional associations (APM, 2012; Garel, 2013; PMI, 2013), or be more or less tailored to or created for an organization's specific needs (Jerbrant and Karrbom Gustavsson, 2013; White and Fortune, 2002). Even if the organization lacks a formal, written PMM, it may still follow typical, fairly established and commonly agreed upon ways of managing projects. In this paper, we take a broad perspective of PMMs and acknowledge that they can be either formal or informal approaches to an organization's management of projects, and they can be built upon the organization's or individuals' established routines.

Sometimes, the suitability of PMMs to environments with dynamics and variety between the projects has been questioned (Morris et al., 2006). Besides changes made to project plans and goals, project personnel can deviate from the behavior instructed by the PMM. Even with agreed-upon PMMs or formal tools, project managers often act intuitively based on their

experience and the problem at hand (Klein et al., 2015). Consequently, they sometimes choose to observe the current situation and act based on its requirements, instead of strictly following the guidelines of a PMM (Jerbrant and Karrbom Gustavsson, 2013). This type of intuitive, spontaneous, and context-dependent practice is called improvisation (Klein et al., 2015).

Project managers and project personnel can have personal reasons for improvising, but generally they are inspired by the perceived inadequacy of existing PMMs or tools to address different situations, or by uncertainty preventing the implementation of a project plan (Klein et al., 2015). It can be argued that improvisation, to some extent, takes place in every project (Baker et al., 2003), and that improvisation in project work is inevitable (Luhmann, 1995).

Improvisation should not be considered a binary action; rather, there are different degrees of improvisation in different projects. Building on Weick (1998), Klein et al. (2015) categorize improvisation into four groups: linear project management (PM), bricolage, pluralist PM, and pure improvisation. At one end of the continuum, linear PM refers to situations in which the degree of improvisation is low, and improvisation refers mainly to minor adjustments made to the existing structures. At the other end of the continuum, pure improvisation refers to situations in which the degree of improvisation is high, and organizational tools and structures play a secondary role. In pure improvisation there is a potentially radical departure from existing plans and the desired outcome is the main concern of the improviser.

Although the body of literature covering improvisation in general is extensive, there are relatively few previous empirical studies focusing on improvisation in project-based organizations, as noted by Leybourne (2006) and Leybourne and Sadler-Smith (2006), for example. Table 2 presents a summary of the existing empirical research on improvisation in project management closely linked with the scope of this study, thereby demonstrating the need

for additional empirical research on improvisation in different contexts and different project types.

*** TABLE 2 TO BE ADDED HERE ***

Table 2. Examples of empirical studies on improvisation in projects and their contribution to this research

The previous research raises three main issues that drive this research effort. First, there is a general lack of empirical research focusing on improvisation in project-based organizations (Leybourne, 2006; Leybourne and Sadler-Smith, 2006). Second, there is a need to study improvisation in different projects and contexts. In particular, there is currently a heavy emphasis on the financial services sector in the existing empirical research, which demonstrates the need to study improvisation in other contexts as well — complex delivery projects, for example (Leybourne and Kennedy, 2015). Third, the research focus of the previous empirical literature is mostly limited to the viewpoint of the project manager (or similar, such as the project portfolio manager). Consequently, the roles of other actors in improvisation, such as the project team members, remain unclear.

Research method

Research design and case organization context

We employ a qualitative research approach and follow a case study strategy. Case study designs are suited to answer "how" questions and to explore the key phenomena in real-life settings (Yin, 2009). The research is designed as a holistic single-case study (Yin, 2009, p. 46) and the unit of analysis is a complex delivery project of an engineering company. The rationale behind employing a single-case design is to study a representative case (Yin, 2009, p. 48); in this study,

we focused on a typical project carried out by an ordinary company that designs, sells, and delivers systems for industrial customers in the engineering industry.

We used purposeful sampling to choose the case organization (Silverman, 2010, p. 141). We sought out an organization with an established history in project-based deliveries. The chosen case organization (referred to hereafter as EngineeringCo) is a medium-sized engineering company. EngineeringCo delivers tailored engineering solutions as customer-specific projects, both as individual devices and as factory-level systems. It is a typical example of a manufacturing company that offers its customers both tangible products and intangible services with different levels of tailoring and technological complexity.

Purposeful sampling (Silverman, 2010, p. 141) was also used when choosing the case project. Together with a representative from the case organization, we sought out a typical, but complex (as perceived by EngineeringCo, in comparison to the different projects carried out in the past) delivery project that had been recently completed or was almost complete. At the time of the study, the chosen case project was near completion. According to the interviewees, the complexity of the case project arose from:

- The size of the project (both in financial terms and its number of subsystems);
- A project schedule that was considered as demanding by the project personnel;
- The customer's requirements considered as demanding and atypical and the customer's actions considered as uncertain by the project personnel;
- The tailoring and engineering requirements (a complex solution to be delivered; technical complexity);
- The challenges linked to the requirements of the installation site, i.e., the old factory building where the project was to be delivered.

Overview of the case project

The case project was a factory-level solution delivery consisting of multiple systems and subsystems. Its lifecycle was typical of that of EngineeringCo's delivery projects (and of similar delivery projects in general). First, there was a sales negotiation phase and a project planning phase, which took place partly simultaneously. These two phases together are called "pre-project phases" in the following subsections. After the project planning phase, the engineering phase began. Partly simultaneously with the engineering phase, the procurement phase began with the components and subsystems to be procured. The manufacturing phase began with the most urgent components and subsystems as soon as the necessary engineering specifications and designs were ready. After the procurement and manufacturing phases, some of the subsystems were tested and then transported to the customer's factory, while some other subsystems were directly transported to the factory. Finally, when the first shipments arrived at the factory site, the installation and implementation phase began. Here, "installation" mainly refers to the physical installation of the components, subsystems, and systems. "Implementation," in turn, refers to the efforts to make the different subsystems and systems work together optimally as a factory-level solution. After the installation and implementation phases, commissioning will take place.

In the case project (and in the context of EngineeringCo generally), PMM refers more to accepted norms and typical behavior than to a formal project management methodology. Although all of EngineeringCo's project deliveries are tailored solutions, they follow similar lifecycles and project managers tend to manage their projects in much the same way, leading to an accepted norm-based approach to PMM.

This study took place during the later stages of the installation and implementation phase, when the project was relatively close to commissioning. When discussing the success of the project

with the interviewees, most of them were quite satisfied and considered the project to have been relatively successful. There had been difficulties throughout the project's lifecycle, particularly in the installation and implementation phase, but interviewees emphasized how, despite the challenges, a solution meeting the customer's scope requirements had been delivered to the customer's site on time.

Data collection

The primary data consists of 17 semi-structured interviews with the case project's core project personnel. The interviewees included the responsible project managers (three people), the main people responsible for the project's different business functions, and several operative employees implementing the project. Interviewees from different organizational levels were included to avoid managerial bias. Data collection is summarized in Table 3.

*** TABLE 3 TO BE ADDED HERE ***

Table 3. Summary of data collection

A semi-structured interview protocol was followed. The interview protocol focused on the whole lifecycle of the delivery project. The interviewees were asked to describe the different changes and deviations throughout the project lifecycle, the perceived reasons for those changes and deviations, the response actions taken by project personnel, and the relationships between the project personnel. The interview protocol included the thematic areas to be covered, but the exact wording and the order of the questions varied between the interviews, depending on the flow of the discussion.

The interviews were recorded and transcribed by an external service provider. The interview data was supplemented with project documentation, particularly project plans. After the interview

data collection, a workshop was organized to summarize the key results of the interviews and enable an open-ended discussion on the project and its changes. Besides serving as an additional data source, this workshop was designed to validate the research findings and the authors' interpretations.

Data analysis

The analysis of the data followed a three-step process. In the first coding round, an inductive approach was taken, and all the sections related to changes to project plans and deviations from PMM (and the project phase in which the change occurred) were coded using open coding. In the second coding round, the open codes were re-coded according to the types of changes, the reasons for the changes, and the different types of response actions taken by the project personnel. The coding framework after the second coding round is summarized in Table 4.

*** TABLE 4 TO BE ADDED HERE ***

Table 4. The main coding categories used in data analysis

In the third phase, four main change management patterns were identified inductively from the data for the different response actions concerning the two types of changes (plan-related and PMM-related): creating alternative paths, re-planning, catching up, and optimizing project performance. The four change management patterns emphasize how the different reasons behind the changes led to different types of response actions taken by the project personnel.

During the coding process, the interviewees' discussions revealed the possibility of the changes and the change management actions being interconnected. A representative example of the interconnected changes was identified among a few potential alternatives based on its repeated

emergence in most of the interviews. To illustrate the interconnections of this example, we mapped the changes, their underlying reasons, and the change management actions onto a flow chart.

For the purposes of this article, selected interview quotations were translated from the original language to English. The original quotations were mostly used verbatim, but the quotations were modified so that the anonymity of the case company and the case project were retained. We additionally used cross-tabulation of the key results to highlight key findings in the data.

Results

Plan-related changes and deviations from the PMM throughout the lifecycle of the case project

An overview of the different changes identified throughout the lifecycle of the case project is presented in Table 5, and an analysis of the changes in each of the project phases is presented in the following subsections. Further analysis of the interconnectedness of the changes is then introduced, and the management actions (change management and improvisation) are analyzed throughout the project lifecycle.

*** TABLE 5 TO BE ADDED HERE ***

Table 5. Summary of the different changes throughout the lifecycle of the case project

As Table 5 demonstrates, both changes to the project plans and deviations from the PMM took place throughout the lifecycle of the case project. In addition, there were different internal and external reasons behind those changes. The different changes and reasons for the changes are discussed further next.

The pre-project phases

Three important changes took place in the early phases of the project: a major change in the project schedule, a deviation from the desired (typical) resourcing of the project, and deviations from the desired (typical) ways of working by EngineeringCo, forced by the challenging customer requirements.

Regarding the schedule change, in the sales negotiations phase discussions were ongoing between EngineeringCo and the customer about a demanding, but relatively typical (from the perspective of EngineeringCo), project schedule. In the earlier bidding phase, EngineeringCo's personnel had calculated a rough estimated schedule. Then, because of the demanding schedule, project personnel had already begun planning the project in greater detail, based on this schedule. In the very last phases of the sales negotiations, however, it turned out that a representative of EngineeringCo's top management had agreed on a new schedule that was several weeks shorter than the already tight original schedule. This was considered a difficulty by the project team — not only because of the shorter schedule, but also because the project team had already planned the project activities based on the original schedule. As one of the project managers explained:

> *"Well, what could we do? We had to accept the new schedule and start to look for ways to speed up the schedule. We started from the new deadline and worked backwards. When do we have to start shipping material to the site? When do we have to start procurement? Which activities could be started a bit earlier or finished a bit faster?"*

The resourcing of the project deviated from the EngineeringCo's typical ways of working as well. Due to the turbulent nature of project-based business, EngineeringCo subcontracts out a

majority of its engineering and a large part of its manufacturing work. To manage the potentially negative side-effects of subcontracting, EngineeringCo tries to collaborate with the same partners from one project to another. However, at the same time as the case project, EngineeringCo was delivering several other major projects. This challenging situation, together with the relatively large size and demanding nature of the project, forced a deviation from the typical ways of working (i.e., the typical resourcing; the PMM) and created several challenges for the project team.

The customer had a strong position in the sales negotiations phase. This was particularly due to the large financial importance of the project for EngineeringCo and the size difference between the customer and EngineeringCo. This situation led to several alterations to the work methods in the later phases of the project. Specifically, EngineeringCo's delivery contracts typically adhere to the company's own templates. In this case, however, the customer's contract template was used instead, which required EngineeringCo to deviate from its standard work practice. For instance, the usage of several materials was prohibited and more detailed documentation and reporting was required than what was typical in EngineeringCo's own PM methodology.

The engineering, manufacturing, and procurement phases

After the pre-project phases, the project progressed to the engineering, manufacturing, and procurement phases. Here, the most important changes were related to the schedule and quality of the engineering work, and the related adjustments to the manufacturing work.

When estimating the schedule for a project, EngineeringCo relies on the expertise of its key personnel and knowledge gained from working on similar projects in the past. A similar approach was followed in the case project. Because of the size of the project and the other simultaneously ongoing projects, EngineeringCo had to subcontract engineering work to

subcontractors with whom it had little or no history of collaboration. This, together with the demanding nature of the project and the extremely demanding project schedule, led to several major delays in the engineering schedule, according to the interviewees.

There were also several problems with the quality of the engineering work. In hindsight, most of the interviewees linked the quality issues to three elements: the inexperience of the (subcontracted) engineers, the incomplete information about the factory site where the solution was delivered, and the customer's requirements. One interviewee explained the demanding nature of the factory site:

> *"...had to go to the factory and really measure how the systems can be installed. If you design this element this way, it could fit under that beam. But then you would have to modify that element that way..."*

The engineering challenges experienced during the engineering, manufacturing, and procurement phases all caused issues in the installation and implementation phase. When discussing ways to control the progress and the quality of the engineering work, a principal designer described the limited possibilities of noticing potential faults in the designs and specifications. According to him, he just had to trust the accuracy of the other designers' work:

> *"[because of time pressure and tight schedules] It is not possible to check all the details of all the designs. Based on my experience, I should know where the potential [problematic] issues are."*

Regarding manufacturing, the challenging and atypical customer requirements affected the manufacturing operations of EngineeringCo as well. In particular, several material choices and work methods were prohibited by the customer. As a manufacturing planner explained:

> *"The use of [a specific work method] was prohibited in the project contract … It meant extra work for us, when we had to go through specifications and look for places where those work methods should be changed to a different work method."*

For the most part, it was simply a matter of going through the specifications and making the required modifications, as explained above. However, there were several situations in which these modifications could not be made and the prohibited work method was the only way to manufacture the specific elements. These situations required the manufacturing planner to instruct the manufacturing employees to alter the approaches to their work; that is, to explicitly instruct improvisational actions. Improvisation was required because the manufacturing employees would follow an engineering specification by default, and carry out the manufacturing based on those specifications. As the manufacturing planner explained:

> *"Then there were cases where [the prohibited work method] could not be avoided. We had to instruct the employees that in these cases, with this work number and this project number, you should not follow the specification but instead use [another work method]."*

In terms of the improvisational actions instructed, mistakes were made. Employees manufactured some elements by following the specifications and forgot the instructions that were specific to this project. Thus, work had to be redone.

Most of the interviewees considered the customer's special requirements relatively unnecessary, particularly because the customer's background was in a slightly different industry in which there was a need to prohibit the use of specific materials and work methods in their products. However, in the systems provided by EngineeringCo, those requirements were not needed. To

further complicate matters, not only were the requirements unnecessary, but some were impossible for EngineeringCo to fulfill. As one interviewee explained:

> *"It would also be important to take into account the manufacturing viewpoints in the sales negotiations phase. So it would not happen that we have agreed on something and then later it turns out that we can't fulfill those obligations."*

The second group of manufacturing-related changes dealt with the delayed engineering work. The criticality of the installation and implementation phase was regularly emphasized by the project personnel. Consequently, the delayed engineering work put pressure on the manufacturing phase to catch up some of those delays. Several re-planning tactics were used to achieve this, including the modification and prioritization of job queues, hiring contract workers, and overtime work. In fact, a big part of the project's delayed schedule was compensated for during the manufacturing phase.

The installation and implementation phase

The installation and implementation phase was considered to be the most problematic by a clear majority of the interviewees, both as it related to EngineeringCo's delivery projects in general and to the case project in particular. The interviewees explained how different issues in the earlier phases of a project might not be immediately noticed and might only become apparent in the installation and implementation phase, thereby causing several deviations from the preferred approaches to the work and changes to the project plan.

An illustrative example is an error in the engineering specifications of several of the project's systems. The case project was delivered to an old factory building, which created several difficulties for the engineering functions. One central item of information regarding the

measurements of the factory building was missing from the specification data provided to the engineers. It was not until the installation phase that the assemblers noticed that the systems could not be installed as planned, due to the incorrect measurements. As an assembly supervisor explained:

> *"Yep, the floor plans of the factory did not match the original specifications. We had to modify the system and build alternative solutions at the site. It does not look good to do those things at the customer's site, you know. And of course it took time."*

Having had problems in the installation and implementation phase of its delivery projects in the past, EngineeringCo had proactively prepared for this to occur in this phase of the case project. For example, the company had tested many subsystems before transporting them to the customer's site, and had invested more in the planning and resourcing of the installation and implementation than it normally would. Despite these efforts, several challenges still took place in this phase. Various reasons for the difficulties in the installation and implementation phase were identified by the interviewees. Errors in the engineering specifications or issues with the quality of the manufacturing work in the earlier phases could not have been noticed before the installation and implementation phase on-site. This was partly because some of the subsystems were too large to be tested before they were transported to the site. As an experienced assembly supervisor explained:

> *"Yes, you can prepare better and plan better. Still some fixing etc. takes place every time. You just can't picture how the system will work in real life just based on the specifications and sketches; you have to see it in reality."*

The sentiment professed in the quotation above was shared by many of the interviewees. The interviewees perceived that a certain level of improvisation was inevitable in the installation and implementation phase. Many of them described how EngineeringCo's systems *"don't work perfectly immediately after you switch on the power."* As the aforementioned assembly supervisor stated:

> *"For instance, you notice that two subsystems don't work correctly in synchronization with each other. Then you just take a pen and a paper and try to figure out what could be done to improve the situation."*

What makes the nature of the installation and implementation phase problematic is the uncertainty related to the changes and deviations. As many managers and designers emphasized, and a clear majority of the interviewees agreed, when the schedule of the installation and implementation phase cannot be followed, it is problematic for the company. One of the managers described the following:

> *"Having learned from earlier projects, we had built a buffer of several weeks into the project schedule, because we wanted to have extra time in the installation and implementation phase. In addition, we really focused on calculating the schedule and resourcing this phase. But still, all the extra buffer was used."*

Other reasons for the challenging installation and implementation phase were errors in the installation work. Similar to the engineers, a number of the employees working on the installation were either inexperienced or not familiar with working with the case company. This was problematic because the control of the installation phase relied to a certain extent on the employees' experience. As an assembly supervisor explained:

"Yes, in theory you just check the specifications and install the system following that. But in practice not everything is written and you just have to know how our systems are designed and how they work."

As the company's PMM relied on people knowing its standard work practice, it is clear that subcontracted engineers with limited previous experience were unfamiliar with the methodology, thereby causing deviations to occur.

Lastly, several issues in the installation and implementation phase were caused by the customer's behavior since the customer lacked experience in the field of systems delivered by EngineeringCo. Notably, the customer's project team lacked expertise in the earlier phases of the project, which caused them to make several wrong decisions. In the later phases of the project, the customer strengthened its project team, after which time it demanded several changes be made to the system design. EngineeringCo had to respond to the requests, which meant additional changes had to be made to the installation and implementation phase timeline. As an example, major changes were required to be made to several items of safety-related equipment, but only after the equipment had been almost completely installed.

Another group of changes originating with the customer related yet again to the old factory building. Because the building had previously been used for a different type of business, it was not entirely suitable for the new systems. It was decided that it was the customer's responsibility to arrange for the required modifications to be made to the factory building. However, the customer struggled with this responsibility and several renovations were delayed — some by several weeks. From EngineeringCo's perspective, this required additional changes to be made to the original project schedule. As the project manager responsible for the installation and implementation phase described:

> *"For instance, one room of the factory building required a new floor, because the old one would not support the weight of the new systems. It turned out, however, that the floor work would be delayed by almost a month. We couldn't do anything about it, we just had to figure out alternative tasks to be done while waiting for the new floor to be built."*

Interconnected changes throughout the lifecycle of the case project

The case project featured some patterns in which many of the identified changes were clearly interconnected, and thereby caused an escalation of the changes — or at least increased the possibility of such an escalation occurring over time. A clear majority of the interviewees described episodes where "a later event occurred due to a change or deviation earlier in the project."

Interconnections were especially evident when the interviewees discussed the problems in the installation and implementation phase. Having learned from numerous previous projects, EngineeringCo — and its project managers in particular — had a strong feeling that the biggest challenge would be the last phase of the project lifecycle. A thought similar to that expressed in the following quote was shared by many interviewees:

> *"Our projects progress very well until the shipments leave the factory and we start installing the system. Then we can spend weeks or months "fumbling" at the customer's premises, in front of the customer's eyes."*

When further analyzing the interconnected changes, a clear majority of the interviewees expressed the view that many of the issues causing problems in the installation and implementation phase could trace their roots to earlier in the project lifecycle. These issues just

had not become visible or topical until reaching the installation and implementation phase. Figure 1 shows an example of the interconnected changes and related actions in the case project. The figure is divided into the perceived reasons for changes, the different changes throughout the project's lifecycle, and the respective change management and improvisational actions performed by project personnel. The arrows illustrate the relationships between the changes and the change management actions, as perceived by the interviewees.

*** FIGURE 1 TO BE ADDED HERE ***

Figure 1. An illustrative example of interconnected changes and change management and improvisational actions

The example in Figure 1 shows that several changes took place in different phases of the project lifecycle and that different personnel performed different actions to react to those changes. This path of actions finally led to the problems experienced in the installation and implementation phase, which were most visible to the outside the project.

Change management and improvisation throughout the lifecycle of the delivery project

The previous subsections have discussed the two types of changes and touched on the respective change management and improvisational actions taken throughout the lifecycle of the case project. Table 6 summarizes the change management and improvisational actions employed by EngineeringCo in relation to those actions.

*** TABLE 6 TO BE ADDED HERE ***

Table 6. Change management and improvisational actions taken by EngineeringCo's project personnel throughout the lifecycle of the case project

The analysis shows that managers and project personnel were active and responsive during all project lifecycle phases when changes took place. Indeed, it was not just project managers who responded to changes, but assembly workers, supervisors, designers, and other project personnel figured out their own unique ways to resolve change events. Four somewhat different change management and improvisation actions were identified as responses to changes, all oriented toward achieving the best possible project performance: creating alternative paths, re-planning, catching up, and optimizing project performance.

Re-planning can be considered a rather typical change management action as a response to plan-related changes, and it was performed mostly by project managers. Following this change management action, project managers reacted to changes in the project plans by creating new, adapted and feasible plans. An illustrative example was the project managers' response to the schedule change demanded by the top management of EngineeringCo.

The three types of improvisational action were all highly interconnected and focused on the need to deviate from the typical ways of project work in EngineeringCo. Regarding alternative paths, the project personnel sought for alternative ways of working due to, for example, work methods prohibited by the customer. Catching up, and optimizing project performance were more improvisational in nature and were mostly performed by other personnel groups, not project managers.

Discussion

In this paper, we have explored the different types of changes that emerged during a complex delivery project, the reasons behind those changes and the project personnel's experiences when dealing with them. The case project — despite experiencing a variety of unforeseen events and carrying out various changes — fulfilled its promise to the customer, and is thereby a good example to show that even with updates and modifications, project success is possible. Below, we discuss the main findings in light of the previous literature.

Different types and sources of changes

In the first research question, we asked: What kinds of changes do project personnel experience during the project lifecycle, including: a) changes to the project plan; and b) deviations from the PMM, and what are the origins of the changes? We purposefully sought out changes to the project plans and deviations from the PMM. Although both types of issues have been covered in previous research, they have either been addressed in separate papers, or not clearly differentiated. This paper has revealed the dynamics and drivers of changes during the delivery project and the interconnections of different changes over time, thereby increasing understanding about the path-dependent nature of changes and change management.

The findings of this study highlight the need to understand and track changes and change management over the lifecycle of a project, instead of describing them merely cross-sectionally. The study demonstrates how changes took place throughout the lifecycle of a delivery project, with the first changes having actually taken place before the official start of the project, and the final changes occurring in the late stages of the installation and implementation phase. The evidence from the case study responds to the identified need to study changes and change

management throughout the lifecycle of a project (e.g., Dvir and Lechler, 2004; Zhang, 2013) and thereby offers a novel, dynamic view to changes and change management.

In this study, we have argued that different types of changes occur in delivery projects. In particular, both plan-related changes and deviations from the PMM took place throughout the project's lifecycle (Table 5). Although the existing literature has acknowledged the existence of both types of changes, they have been studied mostly separately. The findings from the case project offer an example about project personnel resolving the emerging challenges successfully by using change management actions and improvisational actions selectively. Where the project management research and practitioner literature have traditionally followed normative and planning-centric perspectives (Leybourne, 2017), the findings suggests thatunderstanding the role of improvisational actions is important, for the project personnel to master the dynamics of change in complex and uncertain delivery projects.

The reasons behind the changes were identified as internal or external, from the perspective of the project contractor. This follows the generally accepted view that changes can be due to both the project contractor's own behavior and external environmental factors. Concerning the external factors causing the changes, the role of the customer was heavily emphasized by the interviewees. In this case, the customer compelled the project contractor to make changes for three different reasons: stating partly unclear and changing requirements, by setting atypical requirements during the sales negotiation phase, and by not keeping its own commitments during the installation and implementation phase. The problem of having unclear requirements, and to some extent the setting of new requirements, is discussed in the existing literature (e.g., Dvir and Lechler, 2004). The customer's failure to adhere to its own commitments, however, has not been explicitly addressed by existing studies. This issue was also perceived as problematic by the

interviewees; the interviewees discussed how difficult it is for the project contractor to properly complain about the customer's behavior, or make strong demands. Whether this was a unique phenomenon witnessed in one project implemented by a single company should be studied more in future research.

The findings revealed that many of the changes were interconnected and that changes initiated in the early phases of the project transformed into other changes later. For instance, the schedule delays in the engineering phase caused subsequent changes to be made during the manufacturing phase. Similarly, the incomplete information gathered about the installation site in the earlier phases of the project was one of the reasons for the challenges experienced during the installation and implementation phase. The interconnected changes included both plan-related changes and deviations from the PMM, highlighting again the importance of taking into account both types of changes and the dynamics of changes over the lifecycle of the project.

Although the escalating plan changes and PMM deviations could have potentially led to failure, the case project demonstrated that various change management and improvisational actions were used successfully in order to keep the project on the right track. The examples of path-dependency between the changes suggest that changes in projects should not be treated as isolated events or episodes, but rather their interdependencies should be understood as well. The results also highlight the importance of information sharing within the complex delivery project to ensure that all the various implications of the plan changes and PMM deviations are considered, even when moving from one phase to another within the project lifecycle. In a similar vein, poor or ineffective communication between the project actors has been identified as a reason for critical changes in construction projects (Yap et al., 2017). The findings of our study highlight that effective information sharing is even more crucial in situations in which different

personnel are responsible for different phases of a project, which is typical in industrial delivery projects.

Improvising and managing changes over the project lifecycle

The second research question inquired: How do project personnel and managers implement change management and improvisation actions in the different phases of the project lifecycle? To answer this research question, the change management and improvisational actions performed by the different project personnel were identified (Tables 6 and 7). By distinguishing between the two types of actions and mapping them by the active project actors, this study contributes to the general need to study improvisation in project contexts, especially regarding delivery projects (Leybourne and Kennedy, 2015). This paper offers evidence on change management and improvisation as a shared responsibility among project personnel (instead of project manager's task), and on four different patterns of change management.

Our findings raise the need to consider change management and improvisation from the perspective of the whole project team (or project personnel even more widely), instead of focusing only on project managers. The improvisation literature in particular (Table 2), and to some extent the literature on change management as well (Table 1), has focused on the role of the manager — particularly the project manager — in performing the improvisational or change management actions (e.g., Leybourne and Sadler-Smith, 2006). According to the findings of this study, however, project managers were not the only project actors active in performing change management and improvisational actions; instead, different actions were performed by different project personnel. In fact, improvisational actions were taken more often by other project personnel than they were by the project managers, as illustrated in Table 7. Here, the two types

of actions are distinguished so that "change management" refers to the responses to the plan-related changes and "improvisation" refers to the responses to the deviations from the PMM.

*** TABLE 7 TO BE ADDED HERE ***

Table 7. Examples of change management and improvisational actions performed by different project personnel

As Table 7 shows, project managers mainly carried out change management actions, whereas middle managers and experts performed both types of actions, while operational employees engaged in improvisational actions. This finding contributes to the existing literature that focuses on managers and project managers and is yet another main finding that should be tested in future research.

In addition to different personnel performing different change management and improvisational actions, Table 7 also reveals a different focus between the two types of action. In change management actions the focus was mainly on scheduling and customer aspects, while in improvisational actions the focus was mostly on project scope and system functionality. Both the role and the focus aspects contribute to the previously expressed need to understand the nature of improvisation in project contexts better (Leybourne, 2006; Leybourne and Sadler-Smith, 2006), suggesting that different change management and improvisational actions should be designed for different purposes.

Due to the uncertain, dynamic, and turbulent nature of projects, the improvisation of and adaption to the changing requirements of the external environment are essential for project organizations (Leybourne, 2017; Lindkvist, 2008). The four patterns of change management and improvisation actions — creating alternative paths, re-planning, catching up, and optimizing

project performance — show how this adaptation can take different forms in different phases of the project lifecycle. The results demonstrate that these actions are not only performed by the project managers, as emphasized in most of the previous literature, but by other project personnel as well. Nor is the need for adaptation limited to the external environment; rather, the actions of the project organization itself can also necessitate later improvisation.

Conclusions

This study has contributed to the existing body of research on change management and improvisation in delivery projects. The case study provided evidence of the internal and external reasons for changes, described two types of changes (plan-related changes and deviations from a PMM), and highlighted the interconnected nature of changes. As a whole, the study has responded to the calls to understand changes in projects over a project lifecycle (e.g., Dvir and Lechler, 2004; Zhang, 2013), to acknowledge both internal and external reasons for changes and to study improvisation in a project context (Leybourne, 2006; Leybourne and Sadler-Smith, 2006), delivery projects in particular (Leybourne and Kennedy, 2015). The primary contribution of revealing the lifecycle view to changes and change management complements a cross-sectional and static approach to changes and suggests researchers and practitioners to acknowledge path-dependencies between changes and change management.

The study has revealed the distributed responsibility for different types of change management and improvisational actions among project personnel, and the different purposes of the actions. The results of the successful and, yet, constantly changing case project showed evidence that change management and improvisational actions are not only performed by project managers, but also by middle managers, work supervisors and operational employees. The case study

suggested that project managers mainly perform change management actions and operational employees mainly perform improvisational actions, whereas middle managers perform both types of actions. The focus of change management actions was mainly on scheduling and customer aspects, while the focus of improvisational actions was mainly on project scope and system functionality. In all, these findings draw attention to project personnel as micro-level change agents, differing in their championing and scope of influence in managing changes. Thereby, the study contributes by pointing out the actor-centric view to change management.

Finally, the results have demonstrated four different patterns of change management and improvisational actions that were performed due to the changes: creating alternative paths, re-planning, catching up, and optimizing project performance after changes were made. Understanding of such tactics that project personnel use contributes to research in two primary ways. First, they offer more fine-grained knowledge of the practice of change management and improvisation than categorization through the degree of improvisation only (e.g. Klein et al., 2015). Second, they could be further developed into change management templates that combine previously identified change management practices of configuration management (Whyte et al., 2016), coordination (Zhang, 2013), coping mechanisms (Aaltonen et al., 2010; Tukiainen et al., 2010), using information (Whyte et al., 2016), and communication (Butt et al., 2016). The discovered change management and improvisational tactics could be further elaborated, to guide project personnel in dynamic contexts.

Our study has several implications for managers and project management practitioners. First, practitioners should be aware of the two types of changes and the internal and external reasons for them so that they can identify the changes and drivers in practice. Second, the study has identified two types of change-related work practices — change management and

improvisational actions — and four alternative patterns of these practices, offering potential ways to guide personnel in adopting appropriate actions for certain types of changes. The study has also shown how different project personnel have a tendency to follow one or another of the two ways of reacting to changes, and that the two types of change-related actions focus on different purposes. This again may be relevant, when educating project personnel for their change management tasks. Third, the study has emphasized the role of the project customer as a source of changes, and discussed why it is difficult for the project contractor to prevent customer-related changes from occurring. Findings concerning the sources of change are helpful for project personnel when they need to justify and explain their responses to customer-driven changes.

The single-case research design limits the generalizability of the findings, meaning that the extent to which the findings reflect a phenomenon unique to an individual company's single project can be questioned. Therefore, these findings should be tested in a variety of industries and contexts and by using different research designs. The choice of the case company and the case project may cause validity limitations, too. We have justified the choices, described the characteristics of the company and project, and offered background information of the lifecycle of the project, to improve validity.

It is possible that some findings concerning the interconnections between changes and the improvisational responses reflect the particular nature of the PMM in the case company (i.e. it being an established routine, instead of a formal guideline). For example, a more formal PMM with its capability requirements could have been reflected in other kinds of changes and change management and improvisation tactics, and avoidance or easier mitigation of path-dependent

changes. Therefore, it would be of interest to study and understand if the use of a more formal PMM would cause different results in terms of changes and change management patterns.

Finally, there is a limited amount of research on improvisation in projects (Leybourne, 2006; Leybourne and Sadler-Smith, 2006). Many of the few existing studies have focused on the financial industry and a need for research on improvisation in delivery projects has been expressed (Leybourne and Kennedy, 2015). This study is among the very few answering to that call and acknowledging the role of improvisational actions in delivery projects. The findings of this study, especially the alternative patterns of change management, the actor-centric view and the different purposes of the two types of response actions should be studied further and tested with different types of delivery projects.

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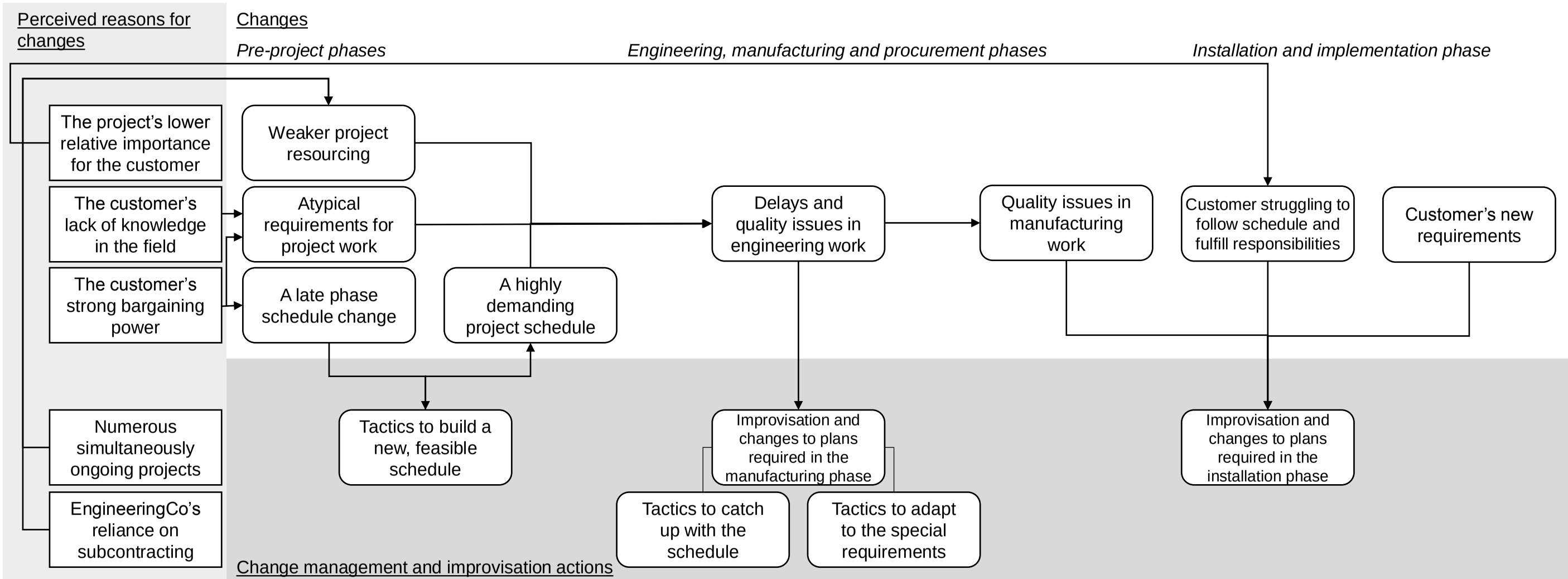
Perceived reasons for changes
Changes
Pre-project phases
Engineering, manufacturing and procurement phases
Installation and implementation phase
The project's lower relative importance for the customer
The customer's lack of knowledge in the field
The customer's strong bargaining power
Numerous simultaneously ongoing projects
EngineeringCo's reliance on subcontracting
Weaker project resourcing
Atypical requirements for project work
A late phase schedule change
A highly demanding project schedule
Tactics to build a new, feasible schedule
Delays and quality issues in engineering work
Improvisation and changes to plans required in the manufacturing phase
Tactics to catch up with the schedule
Tactics to adapt to the special requirements
Quality issues in manufacturing work
Customer struggling to follow schedule and fulfill responsibilities
Customer's new requirements
Improvisation and changes to plans required in the installation phase
Change management and improvisation actions

Table 1. Examples of empirical studies on changes and change management in projects and their contribution to this research

	Research design, data and context	Key findings for this study	Gaps/opportunities for this study
Butt et al., 2016	Two-case study, action research; qualitative data from meetings, documents, etc.; infrastructure and renovation project.	- Relevance of communication routines for stakeholder engagement and evolution of project culture. - Customization of routines for the needs of the project. - Different kinds of changes and change management; relevance of change management throughout the lifecycle of the projects.	- Focus on communication and stakeholder relations – not other aspects of change control. - Construction-centric data – need for studies on other project types.
Dvir and Lechler, 2004	Questionnaire study; data from 448 projects; different project contexts and types.	- Positive effects of good project planning are almost completely overridden by the negative effects of goal changes. Combined effects also significant. - Contextual issues relevant in the planning process.	- Need to study causes of goal changes and develop the change variables further. - Need to study the lifecycle of projects to understand the interactions of planning and changes.
Steffens et al., 2007	Exploratory research, embedded case study with seven projects; interviews, project documentation and change database; telecommunications product development.	- Decision criteria for different changes. - Different decision-making approaches for different changes and projects, even within the same company. - The dangers of too formal change management.	- Need to study the link between types of changes and their control (decision criteria), i.e., contingency view to change management. - Need to understand also other project personnel and not just the managers' views.
Zhang, 2013	Qualitative embedded two-case study (four projects); observation, interviews, documents; two system/solution provider firms.	- "Stage iteration" over the lifecycle of the project because everything cannot be planned in the beginning. - Different levels of planning and iterations. - When project size/complexity increases, issue management becomes more relevant. - Optimization in change decisions due to tensions between stakeholders' expectations.	- Explore the issue in other industries and economies. - Need for in-depth studies on decision-making patterns regarding changes and stakeholders' conflicting interests and objectives concerning them.
Whyte et al., 2016	Qualitative multiple-case study; interviews, documentation, workshop; three organizations delivering complex product systems using digital technologies.	- Different approaches to configuration management in different organizations. - Lifecycle aspect of configuration management is relevant, particularly if the organization is involved in post-project services or operations. - Information of the asset (and related big data) is important for managing changes.	- The idea of "baseline" must be clearly understood and agreed upon. - Itemization of the subsystem of the complex product and related information requires mapping and frameworks. - Models for developing the validity of asset information in digital systems are needed.
Wu et al., 2005	Embedded case study (three subprojects); qualitative analysis of 1038 change orders and statistical analysis of their cost effects; a highway project in Taiwan	- Mapping of change orders, their internal and external causes, and cost effects. - Different engineering properties – different change concerns.	- Need to learn from past projects to anticipate changes in the front-end and planning of new projects.

Table 2. Examples of empirical studies on improvisation in projects and their contribution to this research

	Design, data, and context	Key findings for this study	Gaps/opportunities for this study
Gallo and Gardiner, 2007	Research design and data: Three company cases, interview data Research context: UK financial services sector	- Ten different "triggers" (reasons for flexibility and improvisation). - Projects perceived as more important by project personnel are implemented so that a maximum amount of flexibility, i.e., possibility for improvisation, is retained.	- Focus on financial sector — other industries and project types should also be studied. - The links between flexibility (i.e., improvisation) and control. - Focus limited to managers' perceptions.
Jerbrant and Karrbom Gustavsson, 2013	Research design and data: Two company cases, observation and interview data Research context: Two project management offices: a medium-sized engineering company and a medium-sized private telecom operator	- Structures and situated actions in project portfolios, both at the level of the portfolio and concerning projects. - Methodologies do not provide enough support for sense-making and, therefore, situated actions (i.e., improvisation) are needed.	- Need to understand different types of organizations and different ways to improvise. - Focus limited to improvisation practiced by portfolio managers (and implicitly project managers).
Leybourne, 2006	Research design and data: Case study with six organizations, multiple methods Research context: UK financial services sector	- Extensive use and acceptance of improvisation among the organizations, emerging from the circumstances and context. - Acceptance, application, control, and effectiveness of improvisation differed across organizations.	- Focus on financial sector and strategic change — other industries and project types should also be studied. - Focus quite generally on the organizations' different ways of developing and managing improvisational working practices. - Projects and project-based ways of working only implicitly form part of the study.
Leyborne and Sadler-Smith, 2006	Research design and data: Cross-sectional survey design Research context: Members of APM engaging in project-based change initiatives within the UK financial services sector.	Identified a positive relationship: - between the use of intuitive judgments and improvisation; - between experience and improvisation; - between the use of intuitive judgments and experience; - and between the use of intuitive judgments and externally focused project outcomes.	- Need for research on the relationships between project type, contextual factors, and improvisation outcomes. - Focus limited to the improvisation practiced by project managers.

Table 3. Summary of data collection

Project supplier	EngineeringCo: a medium-sized engineering company delivering tailored engineering solutions as customer-specific projects
Case project	A demanding factory-level solution consisting of multiple systems and subsystems
Interviews	17 individual interviews, average duration 75min (42min-93min)
Interviewees	Job profiles of the interviewees: project managers, managers, planners, supervisors, sales people, operational and assembly workers Areas of responsibilities covered: project management, sales, planning and design, procurement, manufacturing and assembly, safety, installation and implementation

Table 4. The main coding categories used in data analysis

Coding category	Description	Details and examples
The relevant project lifecycle phase	When (in which project lifecycle phase) did the change or deviation take place?	- Sales negotiation - Project planning - Engineering - Procurement - Manufacturing - Testing - Logistics - Installation and implementation
The type of the change: - A plan-related change - A deviation from the PMM	Was it a change to the original project plans, or a deviation from the PMM?	Plan-related changes, for example: - A new project schedule - Work design tactics (job order, overtime work, etc.) Deviations from the PMM, for example: - Altered project resourcing - Altered product design in the manufacturing phase
The reason(s) behind the change: - External - Internal	What were the reasons for the change or the deviation, as perceived by the interviewee?	External - i.e., the reason/s for the change originated outside of EngineeringCo, for example: - Customer's actions or requirements - Supplier's actions or requirements Internal - i.e., the reason(s) for the change originated within EngineeringCo, for example: - Simultaneous projects - Problems in internal communication
The response action taken by the project personnel: - Change management action - Improvisational action	How did the project personnel response to the change or the deviation? Who were the people active in responding?	Change management action - response action to a plan-related change, for example: - New/modified project plans (e.g., a modified schedule) Improvisational action - response action to a deviation from PMM, for example - Alternative work design tactics

Table 5. Summary of the different changes throughout the lifecycle of the case project

Lifecycle phase and change (including the type of change)	**Perceived reason for the change** • internal = the reason(s) for the change originated within EngineeringCo • external = the reason(s) for the change originated outside of EngineeringCo
Pre-project phases	
Plan-related change: A demanding schedule change negotiated by top management without the project team knowing.	External: - The high importance of the project for EngineeringCo and the strong bargaining position of the customer enabling the customer to set requirements for EngineeringCo. Internal: - Lack of internal communication between the top management of EngineeringCo and the project team representatives.
Deviations from the PMM: Several requirements set by the customer. For instance, requirements for documentation, reporting, and prohibited materials.	External: - The high importance of the project for EngineeringCo and the strong bargaining position of the customer enabling the customer to set requirements for EngineeringCo. Internal: - Lack of internal communication between sales and other departments of EngineeringCo.
Deviations from the PMM: Changes to EngineeringCo's desired/customary project resourcing.	Internal: - EngineeringCo's strategic choice to rely heavily on subcontracting in engineering and manufacturing. - Simultaneously ongoing projects combined with the demanding nature of the case project made it difficult to find suitable subcontracted resources.
Engineering, manufacturing, and procurement phases	
Plan-related change: Delays and quality issues in the schedule of the engineering work.	Internal: - Some of the subcontracted designers were less experienced than usual. - The different experience levels were not sufficiently taken into account when planning the project schedule, particularly after the schedule change.
Deviations from the PMM: Work methods prohibited by the customer create difficulties and require innovative actions in the manufacturing phase.	External: - The high importance of the project for EngineeringCo and the strong bargaining position of the customer enabling the customer to set requirements for EngineeringCo. - The customer's background in a different industry, where the prohibition of specific materials and work methods makes sense. For the systems delivered by EngineeringCo, these types of requirements are mostly unnecessary. Internal: - The customer's requirements being agreed to without considering the manufacturing aspects of EngineeringCo.
Plan-related change: Work design tactics in the manufacturing phase.	Internal: - Because of the delays in engineering work, different tactics were used in the manufacturing phase in order to catch up on some of those delays.
Installation and implementation phase	
Deviations from the PMM: Changes and modifications in system installation and implementation.	External: - Incomplete/incorrect data (e.g., about the factory building) provided to EngineeringCo. - Incomplete and changing customer requirements. Internal: - Insufficient internal communication within EngineeringCo. - Errors in engineering specifications and mistakes in equipment installation or manufacturing quality. - Fewer experienced personnel than usual.
Plan-related change: Schedule modifications due to customer's actions.	External: - Customer failing to follow the agreed upon schedule on making factory building modifications.

Table 6. Change management and improvisational actions taken by EngineeringCo throughout the lifecycle of the case project

Lifecycle phase and change	**EngineeringCo's change management and improvisational actions**
Pre-project phases	
A schedule change negotiated by top management without the project team knowing.	- The project managers had to estimate a new schedule for the project. (re-plan) - The fear of significant financial sanctions increased the importance of the project schedule even further. This led to project managers focusing more heavily on schedule planning and on emphasizing the importance of meeting the targets. (re-plan, optimize)
Several changes made to EngineeringCo's standard work methods. For instance, documentation requirements and prohibited material choices.	- An atypical contract had to be taken into account by all departments. (create alternatives, optimize)
Deviations from EngineeringCo's preferred resourcing of the project.	- The less experienced project team members created uncertainty in the project schedule (as they were not completely familiar with EngineeringCo's solutions). Later, the designers and project managers realized that this should have been taken into account in the project schedule by adding time to some tasks. (re-plan, optimize) - In many phases of the project lifecycle, responsible personnel had become used to working with more experienced employees. The responsible personnel had to alter their ways of managing and controlling the work of the less experienced personnel. (create alternatives, optimize)
Engineering, manufacturing, and procurement phases	
Delays in the schedule of the engineering work.	- The delays in the engineering work put pressure on the subsequent phases. Due to the delays, several tactics were used by the manufacturing planners, etc., to catch up with the schedule. (create alternatives, catch up) - The personnel responsible for the manufacturing phases followed the progress of the engineering phase actively and reacted correspondingly. (catch up, optimize)
Prohibited work methods required by the customer caused difficulties in the manufacturing work.	Two types of actions were taken to meet the requirements of the delivery contract: - Specifications were modified by the manufacturing planners and their teams to eliminate the prohibited work methods. (re-plan) - When a prohibited work method could not be avoided, manufacturing employees were instructed to work against the specifications. (optimize, create alternatives)
Work design tactics in the manufacturing phase.	- Several tactics were used by the manufacturing planners, etc., to compensate for the engineering phase's schedule delays. These included the modification and prioritization of job queues, contract work, and overtime work. (catch up, optimize, re-plan)
Installation and implementation phase	
Changes and modifications in installation and implementation.	- Improvisational actions were taken by the assembly workers and supervisors, etc., to figure out the issues in the installed systems and to get the systems working optimally. (optimize, create alternatives)
Schedule modifications due to customer's actions.	- Installation and implementation schedules were modified and alternatives were sought out by the project manager responsible for the installation and implementation phase. (re-plan, create alternatives)

Table 7. Examples of change management and improvisational actions performed by different project personnel

Project actor	Change management actions	Improvisational actions
Project managers	- Schedule modifications. - Negotiations with the customer related to the changing requirements and their fulfillment. - Work design tactics.	
Planners and manufacturing employees	- Work design tactics (e.g., overtime and altered work instructions) to make up for schedule delays.	- Improvisational work and instruction of improvisational work to meet difficult/incompatible customer requirements.
Middle managers, work supervisors	- Work design tactics (e.g., overtime and altered work instructions) to make up for schedule delays.	- New ways of managing the work of less experienced employees. - Improvisational work and instruction of improvisational work to adapt to challenging situations in the installation and implementation phase.
Assembly		- Improvisational work to achieve an optimally functioning system in the installation and implementation phase.

PUBLICATION IV

Value-oriented stakeholder influence on infrastructure projects

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Value-oriented stakeholder influence on infrastructure projects

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Abstract

Project stakeholder management deals with managing and fulfilling stakeholder expectations and has tended to focus on the viewpoint of the focal firm or the project rather than that of the project stakeholders. The stakeholders' perspective is important because they can significantly influence projects, particularly infrastructure delivery involving both public and private actors. This study focuses on the ways that stakeholders pursue influence on projects through their expectation of project value. The goal is to identify the value-oriented reasons for stakeholders to utilize specific influence strategies. A multiple case study was implemented in three transport infrastructure projects. The study argues that stakeholders' expectations of project value creation explain the stakeholder influence strategies utilized. The findings link project value with stakeholder influence strategies and reveal four influence strategies in transport infrastructure projects, differentiated according to their different value priorities. The unique value-influence combinations of public infrastructure projects are revealed and discussed.

1. Introduction

1.1. Research background

Infrastructure projects, such as the delivery of railways, roads, tunnels, subways, etc., shape their surroundings in significant ways. Infrastructure projects are large in financial terms (often considered major or even mega; Flyvbjerg et al., 2004) and the project deliverables are expected to last and deliver value for society for decades or more. Due to their size and impact on society, infrastructure projects create interest in the eyes of various stakeholders. The delivery of long-term value makes infrastructure projects excellent contexts for research concerning project value. This article investigates the influence of stakeholders on infrastructure projects, particularly in terms of their project value expectations.

The concept of project value relates to projects being considered vehicles for the delivery of value throughout their lifecycle, instead of simply the completion of goal-centric tasks (Artto et al., 2016). Previous research suggests that customer value is created through various short-term and long-term costs and benefits and that the customer's purchasing strategy and the supplier's marketing strategy will affect the value created (Ahola et al., 2008). However, in infrastructure projects there are also other stakeholders whose influence may be relevant to the creation of value. Particularly due to their public nature, additional value expectations are set on infrastructure projects by the public sector actors and the general public (i.e., public value; e.g., Koppenjan et al., 2008).

Infrastructure projects require the involvement of and create interest in the eyes of various stakeholders. Stakeholder management is a central aspect of project management, highly emphasized both in the scholarly literature and in the practitioner guidelines (Littau et al., 2010; Mok et al., 2015). With only a few exceptions (e.g., Tryggestad et al., 2013; van den Ende and van Marrewijk, 2018), the majority of the literature on stakeholder management has tended to focus on the viewpoint of the focal firm (i.e., how a project contractor or owner manages stakeholders), with less focus on the perspectives of the stakeholders (Aaltonen and Kujala, 2010; Mok et al., 2015). Due to the high number of stakeholders involved and interested in them, infrastructure projects provide a fruitful avenue for research focusing on the oft-neglected stakeholder viewpoint.

Stakeholders employ different tactics and strategies (i.e., stakeholder influence strategies; Aaltonen and Kujala, 2010) to

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influence the decisions of the focal firm either directly or indirectly. Examples of influence strategies include resource building, coalition building, and conflict escalation (Aaltonen and Kujala, 2010). However, the "whys" behind the influence strategies are insufficiently understood, particularly concerning infrastructure projects. In this article, we argue that the stakeholders' expectation of project value offers a way to understand this aspect of stakeholder influence. By connecting the stakeholders' expectations toward project value to their influence strategies we can better understand the logic behind the utilization of influence strategies. A few recent studies have demonstrated the need for such research by illustrating how ignoring the needs and expectations of the local community or the general public can generate social unrest, collective action and community resistance against infrastructure or construction projects (Liu et al., 2018; van den Ende and van Marrewijk, 2018).

1.2. Research objectives

The objective of this study is to develop new knowledge on value-oriented stakeholder influence on infrastructure projects. We seek to understand stakeholders' attempts to influence infrastructure projects and how these attempts to influence are driven by the stakeholders' expectations and demands for project value. To pursue these objectives the following research questions are formulated:

RQ 1: What kinds of influence strategies do stakeholders utilize in infrastructure projects to achieve their goals?
RQ 2: How do stakeholders' expectations and requirements for project value drive their attempts to influence?

The focus of this empirical study is on project value in infrastructure projects. The study covers the implementation phase of infrastructure projects from the investment decision to the completion of the project. Thereby, value is considered only during the project implementation phase. The study focuses on how the stakeholders' expectations, perceptions, and demands for project value drive their influence; project value will not be evaluated or assessed, per se.

The article is structured as follows. In the literature review, focal research on project value, public value and stakeholder influences is discussed. The empirical research methods are presented in the next section, followed by the results. The last two sections discuss the key findings in light of previous research and present the contributions, conclusions, and limitations of the study. Also future research avenues are proposed.

2. Literature review

2.1. Project value in infrastructure projects

Infrastructure projects are a mechanism to carry out public sector investments into capital that is locally, regionally, nationally, or even internationally useful and impacts society over the long term. We focus on the concept of project value over the lifecycle of infrastructure projects to highlight that infrastructure projects are not assessed merely in terms of their investment costs and deliverables, but their long-term-oriented benefits and costs must be understood as well (e.g., Martinsuo and Killen, 2014)

Project value can be defined as the "quotient of benefits/costs, where value is not absolute, but relative, and may be viewed differently by different parties in differing situations" (Laursen and Svejvig, 2016, p. 2). Project value is not limited to the project implementation phase; instead, it incorporates all benefits and costs over the complete lifecycle of the project, including the use of its deliverables (e.g., Ahola et al., 2008; Laursen and Svejvig, 2016). Previous research used the Sydney Opera House (Shenhar and Dvir, 2007), Heathrow Terminal 5 (Brady and Davies, 2010), and the Astoria Bridge (Eskerod and Ang, 2017) as examples of the necessity to assess value more broadly than just in terms of money spent and immediate deliverables.

Value is a multi-dimensional concept and subjective in nature (e.g., Ahola et al., 2008; Ang et al., 2016; Martinsuo and Killen, 2014). Due to subjectivity, there is a need to incorporate different stakeholders' viewpoints to understand project value well (Ang et al., 2016). Particularly when considering project value over a project lifecycle, there is a need to take into account both financial and non-financial value elements (Martinsuo and Killen, 2014), short-term and long-term value elements (Ahola et al., 2008), and contrast the accumulated benefits with the sacrifices (Ahola et al., 2008; Laursen and Svejvig, 2016). Various studies have already conceptualized and explored the different dimensions of project value (e.g., Ang et al., 2016; Eskerod and Ang, 2017; Flyvbjerg, 2014; Kivilä et al., 2017; Martinsuo and Killen, 2014) and cost and benefit components (Ahola et al., 2008). The diversity across studies indicates that different types of projects may require specific value frameworks.

Some previous studies have discussed project value in infrastructure projects. Kivilä et al. (2017) studied a road tunnel project and analyzed the use of project control in sustainable project management. They adopted the triple bottom line approach (e.g., Silvius and Schipper, 2014) to investigate sustainable value (economic, ecological, and social value), identified different control mechanisms that were used for the different dimensions of value, and drew attention to the role of an alliance contract in governing how sustainable value can be promoted. They also pointed out that some of the project controls originated outside of the alliance organization due to the public sector interest and investment in the project. Eskerod and Ang (2017) studied stakeholder value constructs concerning the Astoria Bridge, using documentation and post-project interviews about 50 years after the project's completion. They utilized existing value frameworks (Ang et al., 2016; Flyvbjerg, 2014), discovered that stakeholders experience value constructs very differently, and recommended stakeholder-specific communication strategies when promoting a project (Eskerod and Ang, 2017). Therefore, previous studies indicate that stakeholders' assessments of value are central to how they voice their interests

and intentions. However, stakeholder influence needs to be better understood in connection to project value.

2.2. Public values in infrastructure projects

Public infrastructure has traditionally been built, owned, operated and maintained by the public sector (i.e., the national government, a city or similar). Nowadays, infrastructure projects are often delivered as common endeavors by the public sector and private sector firms. This collaboration is often organized as alliances (e.g., van Marrewijk et al., 2008; Walker and Lloyd-Walker, 2014) or public-private partnerships (PPP) (e.g., Cui et al., 2018; Hueskes et al., 2017)

A typical rationale for the public-private collaboration in infrastructure projects is the expected higher efficiency of the private sector firms, in comparison to the public sector (de Bruijn and Dicke, 2006). Despite the increased efficiency, critical voices argue that the involvement of the private sector firms can jeopardize other values (i.e., public values). Examples include sustainability (Hueskes et al., 2017) and social responsibility (Zeng et al., 2015).

Public values are particularly relevant to transport infrastructure projects that have a strong impact on people's lives (e.g., Koppenjan et al., 2008). We follow the definition of Steenhuisen and van Eeten (2008, p. 147) and define public value as "a value government decides to try to safeguard following a public demand and within the self-definition of the government role". As the definition implies, public values are such values that the public, represented by the government, considers valuable and worth protecting (safeguarding), potentially at the cost of some other values.

Traditionally, public values have been considered objective, immutable and universal (i.e., an universalistic approach; Koppenjan et al., 2008). The more recent research has questioned the sufficiency of the universalistic approach emphasized the need for more dynamic viewpoints to public values. Consequently, two more dynamic approaches have been proposed: a stakeholder approach and an institutional approach (Koppenjan et al., 2008). In this article, our focus is especially on the stakeholder approach to public values where the main argument is that public values might be universal at a very abstract level, but they are operationalized as results of dynamic stakeholder interactions (Koppenjan et al., 2008). Due to the high number of stakeholders involved in these interactions, stakeholders can perceive public values differently and this subjectivity can lead to tradeoffs and competing public values (Koppenjan et al., 2008).

Previous empirical research emphasizes the categorization of competing public values, their variance over the project lifecycle and strategies for coping with them from the perspective of the infrastructure owner. The focus of Steenhuisen and van Eeten (2008) was on the privatized Dutch railway sector. They described competing public values faced by the train operator and identified strategies for coping with the competing public values. Van Gestel et al. (2008) focused on competing public values in innovative public infrastructure projects. They emphasized the importance of the whole project lifecycle, categorized competing public values, described how some public values received more and some less attention from the stakeholders, and how the focus on different public values varied through the project lifecycle. Van Gestel et al. (2008) identified three main strategies for managing public values as well: management by culture, contracts or hierarchy.

Two main issues justify the need for additional research on this topic: the limited focus on the stakeholders' actions and the limited focus on the project implementation phase. The majority of empirical research on public values has focused on the actions and the viewpoint of the owner: either the public sector (i.e., the national government, city or similar) or the focal company (i.e., the private sector organization involved in public sector activities). However, there are numerous other stakeholders interested, involved and affected by the delivery, operation and maintenance of public infrastructure. Only a few studies have analyzed the viewpoints of these other stakeholder groups from the perspective of public values.

Regarding project lifecycle, only some public value research has studied project-based activities and only a minority of them have focused on the project implementation phase (van Gestel et al., 2008). In contrast, several prior studies have covered public values either at the project front end (e.g., project design) and in the operations phase. The inclusion, acknowledgement and potential jeopardizing of public values is highly relevant in the project implementation phase as well. Various stakeholders try to influence the project implementation phase and in this study it is argued that public values are one viewpoint for understanding these influence efforts better.

2.3. Stakeholder influence strategies in projects

A typical definition for a project stakeholder is "any group or individual who can affect or is affected by the project" (Aaltonen et al., 2008, p. 509). As the definition implies, stakeholders and stakeholder management can be studied from two perspectives: the perspective of the focal firm/the project or the perspective of the stakeholders. In this article the focus is on the perspective of the stakeholders; the viewpoint that has attracted significantly less attention in the existing literature than that of the focal firm or the project (Aaltonen and Kujala, 2010; Mok et al., 2015).

In order to pursue their interests and affect the project, stakeholders set claims for the project and the focal firm and utilize different tactics and strategies to achieve them (Frooman, 1999). In the existing literature, different labels, such as salience shaping (Aaltonen et al., 2008) and influence strategies (Aaltonen and Kujala, 2010; Frooman, 1999), have been applied to describe these tactics and strategies. In this article, the term influence strategy is used.

In his original article, Frooman (1999) built on the resource relationships between the focal firm and the stakeholders to conceptualize four types of influence strategies: indirect and direct withholding strategies and indirect and direct usage strategies. Regarding influence strategies in construction-centric delivery projects, Aaltonen et al. (2008) and Aaltonen and Kujala (2010) (building on Frooman, 1999, Hendry 2005

and Rowley and Moldoveanu 2003), identified several additional influence strategies that stakeholders use in project contexts. These included resource building, coalition building, conflict escalation, communication and credibility building, and direct action strategies.

In addition to explicit stakeholder influence strategies, several authors have studied stakeholder influence on projects more generally. Table 1 summarizes recent empirical research on the influence of stakeholders on projects by including literature on both explicit stakeholder influence strategies and stakeholder influence more generally.

The existing empirical evidence (Table 1) motivates this study in multiple ways. First, the earlier research communicates a coherent overall message of stakeholders influencing projects throughout their lifecycles (van den Ende and van Marrewijk, 2018), suggesting that this influence needs to be understood as a means to shape the project during its lifecycle. These influences, especially the ones opposing the plans or actions of a project (Liu et al., 2018; Olander and Landin, 2005; van den Ende and van Marrewijk, 2018), can be quite strong and affect the progress and success of projects in significant ways. For example, in the study of Olander and Landin (2005), the growing opposition of residents forced a real estate developer to modify its plans significantly approximately five years after undertaking the initial planning work.

Second, earlier studies have conceptualized stakeholders differently, or they have focused on the actions of different stakeholders. The empirical evidence demonstrates how different stakeholder groups exert influence in different ways (e.g., Aaltonen and Kujala, 2010; Li et al., 2012). For example, in the project front-end phase, opportunities for secondary stakeholders to exert their influence are limited (Aaltonen and Kujala, 2010) and the different stakeholder groups emphasize and set different expectations for projects (Li et al., 2012). The evidence of different influence actions performed by different stakeholders, the variety of stakeholders involved and interested in infrastructure projects along with the different conditions in different types of projects (public infrastructure vs. private and commercial construction projects) further justify additional research on different stakeholders' influence strategies.

Finally, none of the earlier studies has explicitly combined stakeholder influence strategies and project value. Some of them identified stakeholder claims with some value linkages (e.g., Li et al., 2012; Liu et al., 2018), or demonstrated a linkage between stakeholder influence and (lack) of project value more implicitly (van den Ende and van Marrewijk, 2018). Research on the multidimensionality of stakeholders' demands has been called for (Aaltonen and Kujala, 2010) as well. However, the combination of influence strategies and value has not been studied or conceptualized. Prior literature has demonstrated how different stakeholders take different actions in different phases of the project lifecycle (Aaltonen and Kujala, 2010), but by complementing the idea of stakeholder dynamics with the viewpoint of project value explaining the stakeholders' actions, a contribution to the oft-neglected stakeholders' perspective on stakeholder management (Aaltonen and Kujala, 2010; Mok et al., 2015) can be made.

3. Research method

3.1. Research design

We followed a qualitative multiple case research design with an intent to explore and describe value-oriented stakeholder influence on infrastructure projects. The benefits of a multiple case design when compared to a single case design include improved generalizability, replication, robustness, and versatility (Saunders et al., 2009; Yin, 2009). In a single case design, the uniqueness and specific context of a case could cause distortion, which is decreased by the multiple case design (Yin, 2009).

In order to study the stakeholder influences throughout the implementation phase of the case projects we followed a process research method. Process research concerns the emergence and evolution of issues over time and patterns of events leading to outcomes (Langley, 1999). It was considered suitable for the tracking of stakeholder influences in the pursuit of their goals over time. As infrastructure projects are public and well documented, a process research method was expected to reveal different types of value-oriented stakeholder influences better than cross-sectional descriptive studies only. Process research methods emphasize the importance of time and temporality in organizations (Langley et al., 2013). This is an important viewpoint for this study because the implementation of an infrastructure project progresses over time and stakeholders sense and evaluate the past and the future and react and exert their influence accordingly.

Transport infrastructure projects were chosen as the context of this study to ensure sufficient similarity between the projects. The expected operational life of transport infrastructure is decades at the minimum. In addition to the direct transport benefits of the project deliverables themselves (e.g., a motorway or a bridge), transport infrastructures often have broader value implications (e.g., connecting regions, environmental aspects, housing benefits). The aforementioned aspects make transport infrastructure projects a fruitful avenue for studying project value. Within the same project type, different projects were selected to ensure sufficient differences between the projects. To enable the focus on project value and stakeholder influence, we set several criteria for the case projects:

1. The project should be a transport infrastructure project and alter its surroundings/affect society in various ways. The project deliverables should have a central role in the transport system.
2. The project should be significant in financial terms (i.e., large/major projects).
3. The delivered infrastructure should create long-term value. The expectation for long-term value creation should have been expressed already at the project front end.

In addition, the following two criteria were set to enable data collection and focus on the implementation phase of project lifecycle (the focus of this study):

Table 1
Empirical research on stakeholder influence on projects.

Study	Method and context	Key findings	Motivation for this study
Aaltonen and Kujala (2010)	- A qualitative single case study - A pulp mill construction project	- A lifecycle perspective on stakeholder influence - Explicit focus on secondary stakeholders - Propositions of stakeholder behavior in project lifecycle phases	- Not focused on infrastructure projects - The likelihood of secondary stakeholders using influence strategies is high during project execution - Value considerations behind stakeholder influence strategies covered only implicitly - Expressed need for additional research on the multidimensionality of stakeholders' demands
Aaltonen et al. (2015)	- A qualitative multiple case study - Two nuclear waste repository projects	- A lifecycle perspective on stakeholder dynamics - A stakeholder salience–position matrix demonstrating the dynamics of stakeholder behavior - Interaction of stakeholders' influence behavior, stakeholder management activities, and projects' contextual conditions influencing stakeholder dynamics	- Not focused on infrastructure projects - Value considerations behind stakeholder influence strategies covered only implicitly - Expressed need for additional research on stakeholder dynamics in later project lifecycle phases (e.g., execution)
Aaltonen et al. (2008)	- A qualitative single case study - A pulp mill construction project	- Salience shaping strategies as ways for stakeholders to increase their salience in the eyes of the focal firm - Focus on the whole project lifecycle (front-end to plant startup, especially implementation)	- Not focused on infrastructure projects - Value considerations behind stakeholder influence strategies covered only implicitly
Cuppen et al. (2016)	- A qualitative single case study as "an empirical illustration" - A shale gas exploration project	- Stakeholder positions are multidimensional and cannot by mapped on a continuum from e.g., 'pro' to 'con' - Q methodology as a tool for collecting diverse stakeholder perspectives	- Focused on a single project just as an empirical illustration - Stakeholder perspectives collected later in the project lifecycle, not during project preparation or planning - The multidimensional nature of stakeholders' value perceptions implicitly discussed
Li et al. (2012)	- A quantitative survey, $n = 199$ - Public infrastructure and construction projects in Hong Kong	- Diverse and conflicting concerns expressed by stakeholders in the project front-end (the official participation process) - Different concerns and expectations emphasized by different stakeholder groups (general public, government representatives, pressure groups, and project-affected groups)	- Focus limited to project front-end - No value framework explicitly utilized, but the findings include various examples of value expectations emphasized by different stakeholder groups - The need for a multi-objective, multi-stakeholder model for stakeholder involvement expressed
Liu et al. (2018)	- Surveys and interviews, $n = 127$ - Major construction projects	- Six reasons for the public to engage in collective action against major construction projects: benefits to the public, characteristics of project performers, layout of projects, living quality of the public, perceptions of the public, and influence from the authority	- Focused on the reasons behind collective action, not the collective actions, per se - Focused on major construction projects (not just infrastructure projects) - No value framework explicitly utilized, but the findings include various examples of value expectations emphasized by the public
Olander and Landin (2005)	- A qualitative multiple case study - Two construction projects	- Power/interest matrix used for stakeholder analysis - Stakeholders influence changes while a project progresses - Stakeholders can have many (mostly negative) influences and consequences	- Focus limited to the project front-end - Only examined one infrastructure project - Value considerations behind stakeholder influence strategies covered only implicitly
van den Ende and van Marrewijk (2018)	- A qualitative, longitudinal multiple case study - Two infrastructure projects	- Different bases for legitimation for the planning and implementation of infrastructure projects - Social unrest and community resistance generated by insufficient legitimation - Institutional response actions taken by the project actors	- Focus on infrastructure projects - Implicit support for the research idea that stakeholders' value expectations/requirements can explain stakeholders' influence behavior

Table 2
Characteristics of the case projects.

	Rail	Tunnel	Subway
Scope of the project	A new railway connection providing improved public transport connections in the capital region and a railway connection to the airport. (https://www.liikennevirasto.fi/web/en/projects/all-projects/ring-rail-line)	The building of a long road tunnel and the redirection of an existing highway to the new tunnel. (https://rantatunneli.liikennevirasto.fi/en)	A major extension of the existing subway network of the capital region. (https://www.lansimetro.fi/en/)
The role of the project in the transport system	One of the main railway lines in the capital region, offering a new public connection to the airport	One of the two main highways around the large city	A major extension to the only subway line in the capital region (and the country)
Location	Capital region (Helsinki and Vantaa, Finland)	The country's 3rd largest city (Tampere, Finland)	Capital region (Espoo and Helsinki, Finland)
Stakeholders	Internal: City 1[b] and City 2[b], contractors, government and public agencies	Internal: City 4[b], contractors, government and public agencies	Internal: City 2[b] and City 3[b], contractors, government and public agencies
	External: General public, business representatives, organizations	External: General public, business representatives, organizations	External: General public, business representatives, organizations
Duration of the implementation phase[a]	~6.5 years	~3.5 years	8 years
Project budget (at completion)	~€800 million	~€200 million	~€1.1 billion
Project performance	Completed over budget and behind schedule.	Completed slightly under budget and ahead of schedule, but with some additional work remaining.	Completed significantly over budget, significantly behind schedule, and with a major change in project design.

[a] Implementation phase ranges from the investment decision to the completion of the project.
[b] Cities 1–3 are three of the largest cities in the capital region of the country. City 4 is the city implementing the road tunnel project. City 2 was involved in both Rail and Subway, but its role in Rail was very minor.

4. The project should be recently completed or near completion.
5. There should have been an active discussion in national and/or local newspapers regarding the project, and other public data (such as plans, reports, other public project communication) available.

Following the selection of the project type and the five criteria above, three case projects were selected for investigation: a railway project (Rail), a subway project (Subway), and a road tunnel project (Tunnel). Basic characteristics of the projects are summarized in Table 2. All three case projects are relatively large, clearly value-oriented and created interest in the eyes of various stakeholders. All three projects had a central role in developing the regional transport systems. In general, these projects are good examples of large transport infrastructure projects that are commonly implemented around the world.

3.2. Data collection

Following the process research method (Langley et al., 2013), we used a document-based data collection approach to track the key events of the case projects over time. The primary research data utilized in this study were newspaper articles. Archival data such as newspaper articles are particularly suitable for studying longitudinal event chronologies over long periods of time (Langley et al., 2013). Newspaper data have been successfully used in earlier project business research as well (Kivilä et al., 2017; Ruuska et al., 2011). However, newspaper articles as research data have several limitations, especially in terms of the possible bias or partiality of the journalists writing them (see also Ruuska et al., 2011). It is also possible that the less powerful stakeholders receive less attention in the newspaper articles. To mitigate these limitations, we complemented the primary data with project documentation (if publicly available) and by utilizing the additional documentation for triangulation. No direct interaction (interviews, etc.) with the project stakeholders was utilized. In some countries, the actions of the media are limited by governmental restrictions or censure; regarding this study, the target country is ranked very high in terms of freedom of the press.

All case projects were implemented in the same country (Finland). Two of the three case projects, Rail and Subway, were implemented in the capital region of the country. For these projects, Newspaper 1 was used as the data source. Newspaper 1 (Helsingin Sanomat) is the leading newspaper both nationally and in the capital region. For Tunnel, two newspapers (Newspaper 1 and Newspaper 2) were used as data sources. Newspaper 2 (Aamulehti) is the leading newspaper for the city (City 4) and the region in which Tunnel was implemented.

The electronic web archives of the two newspapers were used for data collection. The web archives include all the articles published in the newspapers irrespective of their type (e.g., column, editorial, news article, opinion piece, etc.). The available data sets covered the entire implementation phases of all three case projects. The case projects have a distinctive

Table 3
The reduction of the final dataset.

	Rail	Tunnel	Subway	Total
Articles in the initial dataset	242	232	819	1293
Data after excluding the irrelevant articles	114	141	491	746
Relevant articles with stakeholder influences (the final dataset)	62	32	242	336

name widely used by the media in this country, and this name and all of its inflected forms (either using an asterisk or as multiple searches) were used as search terms. The searches were targeted at the full texts of the articles, leading to a large dataset with all the relevant articles, but yielded numerous irrelevant articles as well (see Table 3).

After the initial dataset was collected, the irrelevant newspaper articles were excluded. An article was considered irrelevant if its focus was not on a case project, even if the project was mentioned in the full text. After identifying the relevant articles focusing on the case projects, a second screening process was performed to identify the articles that included content related to stakeholder influence. An article was included in the final dataset if there was mention of a stakeholder having influenced or aiming/planning to influence the project or if the behavior of a project stakeholder was described in any way. The reduction of the data set to the final relevant articles is summarized in Table 3.

Additional project-related documentation and communication materials for the case projects were collected from three main sources: the projects' own websites, the ministry of transport website, and the local cities' web archives. These additional data included such documents as project plans and project reviews. The secondary data were used to verify and validate the findings from the primary data and to describe the projects' backgrounds.

3.3. Data analysis

A qualitative event-oriented approach was followed in the data analysis. By forming chains of events, or by becoming "strong" enough to produce change or variability, events play a central role in various organizational phenomena (Morgeson et al., 2015). In this study, we conceptualized the stakeholders' influence efforts as events. The classification of the influence efforts as events enabled the influence efforts to be studied chronologically and revealed the possible interconnections between the events and the stakeholders' actions.

The events were analyzed so that all later incidences related to the initial influence effort were coded with the same event ID number. Consequently, the duration of the events varied significantly, ranging from a single day to almost a year. For example, the event Tunnel.1 included residents complaining about Tunnel and the court rejecting the appeals four months later. In addition to the newspaper articles, evidence of influence efforts was sought from the project documentation.

All the articles in the final dataset were content coded. In addition to identifying and mapping the event structure in each case systematically, the coding focused on three main aspects: the active stakeholders, the influence strategies used by the stakeholders, and the project value dimensions driving the influence strategies.

Regarding influence strategies, the earlier findings of Aaltonen and Kujala (2010) were used as a starting point for developing the preliminary coding framework. The preliminary influence strategies sought from the data included: direct and indirect withholding or usage strategy, resource building strategy, coalition building strategy, conflict escalation strategy, communication and credibility building strategy and direct action strategy. The rationale for using the work of Aaltonen and Kujala (2010) as a basis was their explicit focus on stakeholder influence strategies in projects. The framework was inductively altered when needed. Ultimately, only the "communication and credibility building" strategy of the preliminary framework was directly evident in the data and the inductively identified "complaining and resolving disputes" strategy had a close resemblance with "conflict escalation strategy" in the final framework. The other influence strategies were identified inductively, and the final framework is described in Table 4.

Potential reasons for the differences between the identified influence strategies and the strategies in the preliminary framework (Aaltonen and Kujala, 2010) include the different project context (private vs. public; mill construction vs. transport infrastructure) and the strong connection of the preliminary coding framework (Aaltonen and Kujala, 2010, building especially on Frooman, 1999) to ownership, utilization, and access to resources. A resource-viewpoint was significantly less evident in the data of this study.

Earlier literature (e.g., Ahola et al., 2008; Kivilä et al., 2017; Labuschagne and Brent, 2005) was utilized also to build a preliminary framework for analyzing project value. Based on the potential value components identified from the earlier literature, a preliminary coding framework was created with three value dimensions (environmental and social value, financial value, and benefits for people), each including several examples of more detailed value components. In the end, it turned out that environmental and social value and financial value were relevant for this study as well. The third value dimension was re-labeled from "benefits to people" to "systemic value", based on the data. With the new label we wanted to emphasize the broader nature of the benefits characteristic of large transport infrastructure projects. With systemic value we refer to the benefits and costs of the projects for their wider surroundings, not just for the nearby people (indicated by the title in the preliminary coding framework). Regarding all three value dimensions and the respective value components, value related to both the project implementation process and the use phase of the project deliverables was acknowledged. The coding approach for the value dimensions is also summarized in Table 4.

Coding took place in the original language of the newspaper articles (Finnish), which is also the native language of the authors. After the case-level coding, commonalities and differences were sought across the three projects, and the cross-case thematic analysis is reported in the results. For the purposes of this article, illustrative quotations were identified

Table 4
The final coding framework for stakeholder influence strategies and project value dimensions.

Stakeholder influence strategy	Definition	Examples
Communicating	Stakeholders utilize media to reach a wider audience for their claims.	- Residents writing opinion pieces. - Experts, business representatives, etc. writing opinion pieces. - Journalists discussing the projects in editorials and news analyses.
Complaining and resolving disputes	Stakeholders oppose project's plans or actions formally or informally. The opposition can lead to formal appeals and legal decisions.	- Residents complaining about a project's plans or actions. - Residents lodging appeals and formal complaints. - Disputes with contractors, suppliers, etc. - Stakeholders threatening each other with legal action. - Litigation and court decisions.
Setting rules and supervising the project	Stakeholders set rules and supervise the project work or the project deliverables.	- Cities and other authorities set rules for and limitations on the project work. For example, time restrictions on performing noisy work. - Authorities supervise the project deliverables; for example, safety requirements.
Using decision-making authority	Stakeholders use their decision-making authority.	- Powerful stakeholders make independent decisions enabled by their decision-making authority - Independent decisions made by the cities. - Decisions of the cities or the transport authorities on public transport timetables, routes, etc. - Funding decisions by the government.
Project value dimension	Definition	Examples
Environmental and social value	The aspects of the project work or the project deliverables affecting the environmental or social well-being of the people.	- Beauty, comfort, and other aspects of social well-being. - Dirt and rubbish, dust, noise, and safety issues.
Financial value	The financial aspects of the project work or the project deliverables.	- Funding. - Income. - Project costs. - Sanctions and financial compensation. - Share of costs.
Systemic value	The value linkages between the project and other projects or the project's surroundings.	- The influence of the project on the existing transport infrastructure. For example, changes to bus timetables or routes. - The pressures caused by the projects to develop their surroundings. For example, housing plans for neighborhoods near new stations.

from the data and translated into English, and they are used to highlight central messages in the findings.

The last phase of the data analysis focused on identifying the connections between stakeholder influence strategies and the dimensions of project value. For each influence event in all three case projects, the combinations of value dimensions (i.e., the stakeholders' expectations or requirements for value driving the influence effort) and the most utilized stakeholder influence strategies were mapped and the dominating value dimension–influence strategy pairs were identified. A value dimension-influence strategy pair was labeled “high importance” if the respective influence strategy was evident in most of the influence efforts driven by the respective value dimension. Respectively, the label “low importance” was used if there were none or only a few instances in the data. The label “medium importance” refers to a situation between “high” and “low”. The instances of these pairs were calculated and then summarized across the cases to identify their relative importance, and the dominating connections were cross-tabulated.

4. Results

The results section is organized in three subsections. We begin by presenting the influence strategies utilized in the case projects. Next, the dimensions of project value driving the influence strategies are discussed. The results section concludes with a cross-tabulation that reveals the dominating combinations of project value and influence strategies across the three case projects.

4.1. Stakeholder influence strategies

The stakeholders of the three case projects utilized different stakeholder influence strategies to exert their influence. All four types of influence strategies appeared in all the projects, but somewhat differently. These strategies are summarized and exemplified in Table 5.

Stakeholders utilized media for communication in all three projects. In Rail and Subway especially, there were several opinion pieces discussing the need for different or modified project designs. These opinion pieces mostly claimed that incorrect project designs had been selected in the front-end phase, or that modifications to the project design should be made due to some issues in the implementation phase. For example:

> Unfortunately, the new train connection will benefit only the residents of the capital region. At the same time, a direct connection from [several larger cities of the country] to the airport should have been built. (Rail; Opinion piece, Newspaper 1)

Table 5
Stakeholder influence strategies utilized in the case projects.

Stakeholder influence strategy	Rail	Subway	Tunnel
Communicating	- Stakeholders propose alternative project designs via media.	- Stakeholders propose alternative project designs via media. - Stakeholders use media to communicate their dissatisfaction with the project.	- Stakeholders use media to communicate their dissatisfaction with the project.
Complaining and resolving disputes	- Residents oppose the project's plan to set up a rock blasting station near a residential area. - A contractor and the project leaders dispute the share of costs of additional work. - Residents oppose the planned modifications to bus timetables.	- Stakeholders lodge appeals against the project. - Residents oppose zoning plans related to station areas. - A trade union complains about non-compliance with collective agreements by some subcontractors. - A supplier and contractors dispute with the project leaders about contractual responsibilities and compensation. - Residents oppose the planned modifications to bus timetables.	- Stakeholders lodge appeals against the project. - Residents communicate their concerns about dangers and damage caused by the tunnel work. - Residents communicate their concerns about the effects of the tunnel on air quality and the inadequacy of air filtering.
Setting rules and supervising the project	- Regulation by authorities limits the project work (e.g., hours when noisy work can take place).	- Regulation by authorities limits the project work (e.g., when noisy work can take place). - Supervision by authorities postpones the project (i.e., safety requirements for the subway).	- Regulation by authorities limits the project work (e.g., when noisy work can take place).
Using decision-making authority	- The government postpones its funding for the project. - The Regional Transport Authority evaluates whether some stations should be skipped to speed up travel. - City 1 changes the location of one station, renames another, and puts more design effort into a third station.	- Both cities demand explanations from the project and order independent reports about confusion over project costs and decision making. - The Regional Transport Authority and City 3 modify bus timetables and routes in response to project schedule information.	- Some politicians demand explanations from the project about the inadequacy of air filtering and the additional costs.

In all three projects there were some disputes between stakeholders and the project representatives. The disputes mostly took place between residents and the projects, or the suppliers, contractors, or subcontractors and the projects. Regarding residents, in both Subway and Tunnel the initiation of the implementation phase was endangered by formal appeals lodged by some critical residents. However, these appeals were rejected by the courts.

In Rail, some concerned residents opposed the project's plan to set up a rock blasting station near a residential area. The residents' opposition forced the project to shorten the hours for carrying out noisy work. However, the project was still planning to set up the blasting station in the same location, which amplified the residents' opposition. The residents joined forces and lodged a high number of formal appeals, finally forcing the project to change its plans. As the situation was described in Newspaper 1:

> "Not going to happen!," was the response from a group of potential neighbors [of the planned rock blasting station]. Over 30 formal appeals were lodged by yesterday's deadline. "It is not that much about the traffic noise; there is a nearby highway anyway. The main concern is the noise from the rock blasting," spokesman of the neighborhood explained. (Rail; News article, Newspaper 1)

Disputes between the projects and formal partners took place in Rail and Subway especially. In both projects, and even more so in Subway, the project and a partner disputed the cost of additional work, the fulfillment of contractual responsibilities, or entitlement to compensation on several occasions. The greatest dispute was between Subway and the main automation supplier. The supplier first struggled and then finally failed to deliver the automation solutions for the subway. The two parties negotiated, pushed, and threatened each other for years. As Newspaper 1 analyzed the situation afterwards:

> The project was terminated and Supplier, the transport agency of City 2, and Subway are blaming each other. According to Supplier, the buyers did not know how to buy; according to the buyers, Supplier did not know how to deliver. (Subway; News analysis, Newspaper 1)

The rules and supervision enforced by different authorities influenced the case projects as well. In all projects, the authorities (e.g., the cities or national regulators) set rules for the project work, such as setting time limits on noisy work. In addition to project work, the rules and supervision of the authorities were focused on the project deliverables as well. This was most evident in Subway, where one of the last major reasons for delays to the schedule was the project's inability to meet the safety requirements set:

> The opening of the new subway will be delayed. The delay might even be months. The problems are related to the testing of the safety systems. 'There are risks related to the control systems,' the president of Subway Ltd. explains. (Subway; News article, Newspaper 1)

Finally, in all three projects there were powerful stakeholders with decision-making authority influencing the projects. When a powerful stakeholder made decisions affecting the projects, the projects could do little more than adapt to the situation. For example, in Rail the government decided to postpone its funding for the project:

> The commitment for government funding is still valid and the project will receive the millions of euros promised later. Some work will have to be re-scheduled to later years, however (Rail; News article, Newspaper 1)

4.2. Project value driving the stakeholder influences

Expected project value drove the stakeholders to exert their influence on infrastructure projects in somewhat different ways. Possibly due to the differences in the scope of the projects, Rail and Subway (which were more complex and crossed city boundaries) differed from Tunnel in how systemic value was experienced. The findings concerning the three project value dimensions in the case projects are summarized in Table 6.

4.2.1. Environmental and social value

Two aspects of environmental and social value were emphasized in the data: stakeholders (especially residents) requesting more value or complaining about negative value, and stakeholders (especially authorities) regulating environmental and social value.

Regarding stakeholders' requests for value, there were a few cases in all three projects where a resident or a group of residents raised their concerns. Examples included dust and noise disturbances caused by the project work and rubbish and dirt left behind by the projects. Most typically, the concerned residents utilized the media to bring their issues to the attention of the public (and possibly the project itself as well). Almost every time, the project responded quickly and tried to resolve or mitigate the problem.

On significantly fewer occasions, people demanded better consideration of the environmental and social aspects of the project deliverables. For example, in Subway some artists

Table 6
The dimensions of project value driving stakeholder influence in the three case projects.

	Rail	Subway	Tunnel
Environmental and social value	- Authorities set rules for the project work (e.g., hours when noisy work can take place). - Residents communicate their concerns about the negative effects of the project work on the environment. - Residents oppose the project's plan to set up a rock blasting station near a residential area. - City 1 puts more design effort into one station.	- Authorities set rules for the project work (e.g., hours when noisy work can take place). - Residents communicate their concerns about the negative effects of the project work on the environment. - Residents oppose zoning plans related to station areas. - Authorities' supervision postpones the project (i.e., safety requirements for the subway).	- Authorities set rules for the project work (e.g., hours when noisy work can take place). - Residents communicate their concerns about the negative effects of the project work on the environment. - Residents communicate their concerns about dangers and damage caused by the project work. - Residents communicate their concerns about the effects of the tunnel on air quality and the inadequacy of air filtering. - Some politicians demand explanations from the project about the inadequacy of air filtering.
Financial value	- A contractor and the project dispute the share of costs of additional work. - The government postpones its funding for the project.	- A supplier and contractors dispute with the project about contractual responsibilities and compensation. - Both cities demand explanations from the project and order independent reports about confusion over project costs and decision-making. - A trade union complains about non-compliance with collective agreements by some subcontractors.	- Some politicians demand explanations from the project about the need for additional funding.
Systemic value	- The Regional Transport Authority evaluates whether some stations should be skipped to speed up travel. - Residents oppose the planned modifications to bus timetables. - Stakeholders propose alternative project designs via media.	- Politicians demand explanations from the project about the capacity of the subway after the automation failure. - The Regional Transport Authority and City 3 modify bus timetables and routes in response to project schedule information. - Residents oppose the planned modifications to bus timetables. - Stakeholders propose alternative project designs via media.	- N/A

demanded that more art be included in the design of the new subway stations. Although some art was purchased for all stations, the artistic investment did not meet the expectations of the art representatives. In Tunnel, a tempestuous discussion in the media was sparked when some residents (and politicians) became worried about the new tunnel's potentially inadequate air filtering solution. Although the media and the politicians required several responses from the project, no real changes to the project deliverables took place. As Newspaper 2 described the situation:

> "Air pollution caused by Tunnel are concerning the nearby residents. "Shouldn't the exhaust air be filtered?," the residents are asking. "The National Meteorological Institute has made numerous studies about the situation [demonstrating no need for filtering]," was the answer from the project alliance. (Tunnel; News article, Newspaper 2)

Finally, the projects had environmental and social effects on their surroundings as well, which caused resident outcry. This was most evident in Subway, where the city put considerable effort into developing neighborhoods close to the new subway. In particular, most of the areas to be developed were already residential areas, many with relatively long histories. As was analyzed in Newspaper 1:

> In City 3, the new subway will be built under an existing suburb. For transport technology and financial reasons, the subway creates urban density pressures. Compressing and centralizing environments with memories and history is never easy. (Subway; Expert analysis, Newspaper 1)

The residential development of the existing neighborhoods (more centralized housing, higher buildings) received quite a lot of opposition from people, especially the residents of those neighborhoods. Although some alterations to the plans were made — some tower blocks were lowered, for example — the general goal was not altered. As a representative of City 3 explained:

> The chief of city planning does understand some of the criticism. However, taller buildings are necessary to cover the costs of the new stations. (Subway; News article, Newspaper 1)

In contrast to Subway, Rail faced very few similar challenges. This can be quite clearly linked to the new railway being built further away from existing residential areas; because of this, it attracted less opposition from the residents.

Regarding the regulation of environmental and social aspects, several authorities set rules and limits for the projects. These rules and limits were related to time restrictions on performing noisy work or regulations for measuring the effects of the project work on air quality and nearby water sources, for example. The authorities focused on the environmental and social aspects of the project deliverables as well. In particular, one main reason for the final delays in Subway was the project's inability to meet the safety regulations set for the new subway.

4.2.2. Financial value

Two aspects of financial value were particularly dominant in the data: stakeholders (especially suppliers and contractors) defending their financial rights and project financiers (i.e., cities and the government) making financial decisions and demanding financial information.

There were a few disputes between the project owners and the contractors in all three projects. Although the origins of the disputes could often be traced to other issues, the disputes themselves, or even litigation, were almost always focused on money. For instance, both in Rail and in Subway there was a major dispute over the share of additional costs or on the liability for sanctions between the project owner and a contractor. In Rail, the two parties reached a consensus before ending up in a legal battle. In Subway, a long legal fight was still ongoing after the project implementation.

The aforementioned disputes can be seen as incidences of stakeholders defending their financial rights. A similar event took place in Subway, when a few small contractors failed to follow the regulations set in the collective agreements. A trade union utilized the media in bringing the issue to the attention of the public (and possibly to the project itself as well):

> Collective agreements are violated systematically at Subway's construction site. According to a trade union of transport workers, dozens of truck drivers receive salaries lower than defined in the collective agreements. (Subway; News article, Newspaper 1)

The funding for all three projects was provided by the cities and the government. The financier position could have enabled the cities and the government to exert their financial influence on the projects. However, there was only one significant example of this taking place. In the early implementation phase of Rail, the government was facing a relatively difficult economic situation. Consequently, the government decided to postpone part of the project funding, forcing Rail to re-schedule some of the project work. As the challenging situation was described in Newspaper 1:

> The government cuts seven million Euros from the budget preliminary allocated for Rail. Minister of Transport and Communications emphasizes that the overall funding from the government remains the same. In practice, the government "loans" some money from the upcoming year's budgets. (Rail; News article, Newspaper 1)

The cities roles as powerful financiers could have enabled them to exert influence on the projects. However, the cities' financial influence on the projects was quite limited in practice, and the cities were more often just recipients of financial information from the projects. In all three cases, the projects requested and received additional funding from the cities during the implementation phase. Although all of the extra funding needed was granted, the cities demanded explanations for the need for extra funding from the projects. This was especially evident in Subway.

In addition to being delayed numerous times, Subway's total costs multiplied as well. In addition to the cost increases, politicians complained about the uncertainty and confusion related to the total costs and the inability of the cities to follow-up on or affect project costs. This inability was mostly due to the Subway project being managed as a limited company instead of falling under the responsibility of a particular city department. As Newspaper 1 described:

> We are still not told WHY the budget was exceeded so significantly. We had no possibilities to mitigate the growing costs (a representative of the City 2 Transport). (Subway; News article, Newspaper 1)

In addition to demanding and requesting information from the project, City 2 and City 3 did order several independent evaluations and reports as well. These all focused on the uncertainties in project costs, decision-making, and information sharing between the project and the two cities.

4.2.3. Systemic value

In all three projects, different people (residents, business representatives, experts, etc.) argued for a different project design on several occasions. These arguments were often based on the perceived user value of the infrastructure and communicated as opinion pieces in the newspapers. They often dealt with not just the project or infrastructure, as such, but its linkage to other infrastructures, other projects, and alternative project designs. Due to this interconnectedness, we labeled this value category 'systemic value.' For instance, in Rail there were several opinion pieces focusing on the benefits of a direct connection from the main national railway to the new airport railway instead of a transfer connection:

> Unfortunately, the new train connection will only benefit the residents of the capital region. At the same time, a direct connection from [several larger cities of the country] to the airport should have been built. (Rail; Opinion piece, Newspaper 1)

Common to a clear majority of the incidents such as the aforementioned was that the project design had already been decided in the front-end phase. Consequently, the opinion pieces seldom received any official response from the project and no changes to the project design were performed.

Also calling for a different project design, in Rail there were concerns about the new railway connection being too slow. This time the project responded and the Regional Transport Authority performed test runs. The goal of the test runs was to evaluate whether a few of the pre-planned stations could be skipped in order to speed up travel times (i.e., a user benefit). Skipping some of the old stations would have generated some cost savings as well. However, it turned out that no significant travel time savings could be achieved.

Of the three projects, especially Rail and Subway created a significant change to the existing transport infrastructure. When the new rail connections were implemented, the existing public transport network (i.e., bus connections) was partially altered. In both projects, and particularly in Subway, there were people who benefitted from the new subway or railway and people who suffered from the altered bus connections. Criticism of the altered bus connections started to grow when the project was nearing completion and the details of the new routes and timetables were starting to take shape. The "unlucky" people did pursue changes to the timetables by writing opinion pieces, giving direct feedback to the planning authorities, and by participating in events organized by the projects. Although some minor changes did take place, the general phenomenon of some people benefitting and some people suffering persisted. As was described shortly after the completion of the project:

> At the same time, when many residents of [a suburb in City2] are happy about the opening of the Subway, "rebellion is growing" in the neighboring area. Over 2,500 people have signed a petition demanding a direct bus connection to the city center, instead of just a route to the subway station. (Subway; News article, Newspaper 1)

The final illustrative example was the problem related to the automation of Subway. In the front-end phase of the project, it was agreed that the new subway should be automated (instead of using drivers). Consequently, enabled by the automation and affected by cost pressures, a decision was made to build the platforms of the new station shorter than the preexisting platforms. This decision limited the length of the trains, but the shorter headway enabled by the automation was supposed to secure sufficient capacity, despite the trains' shorter lengths.

When the project implementation progressed, the challenging nature of the automation project began to be revealed and the number of problems began to grow. Despite numerous negotiations, pressure, and threats between the project and the automation supplier, it started to become apparent that the automation project would fail, resulting in a subway with shorter trains manually driven by drivers.

The worried residents, experts, and politicians expressed their concerns about the new subway becoming crowded and its capacity becoming insufficient in the very near future. As two representatives of the City 2 Transport wrote in an opinion piece:

> The shorter trains and the 2.5-minute headway are only estimates, which are not based on real life experiences. Even now [before the subway extension], maintenance work does take place affecting the real headway of the subway network. (Subway; Opinion piece, Newspaper 1)

The project responded by issuing assurances that the concerns were exaggerated and that the subway's capacity would be sufficient for a long time to come.

Residents, experts, and politicians proposed several ways to solve the problem. For example, it was proposed by a few residents and experts that longer trains could be used despite the new stations' shorter platforms. It was also proposed, and even demanded by some politicians, that despite the front-end decision, the tunnels should be dug longer, thereby enabling the platforms to be lengthened as well.

Table 7
Stakeholder influence strategies utilized for stakeholder influence efforts driven by different project value dimensions.

	Communicating	Complaining and resolving disputes	Setting rules and supervising the project	Using decision-making authority
Environmental and social value	- Issues communicated by stakeholders, especially residents, via media.		- Authorities setting rules for the project work (e.g., hours when noisy work can take place) and supervising the project deliverables (e.g., safety aspects.	
Financial value	Importance[a]: high	Importance: low - Contractor and supplier disputes (including some legal battles) with the projects about the share of costs, compensation, etc.	Importance: high	Importance: low - Powerful financiers (i.e., the central government) adjusting their project funding. - Powerful stakeholders (i.e., cities) demanding explanations of project costs.
Systemic value	Importance: low - Stakeholders communicating aspects frequently via media. - Numerous events, but little influence exerted on the projects → only medium importance.	Importance: high	Importance: low	Importance: high - Stakeholders (e.g., cities and transport authorities) performing some evaluations and modifications. - Politicians demanding explanations from the projects. - A medium number of events, but little influence exerted on the projects → only medium importance.
	Importance: medium	Importance: low	Importance: low	Importance: medium

[a] Importance refers to the relative dominance of the influence strategies for influence efforts driven by the specific value dimensions. For example, the "Importance: high" in the top left cell of the table means that communication was a dominant influence strategy for influence efforts driven by environmental and social value. The importance (low, medium or high) was evaluated based on the frequency of each value dimension-influence strategy pair in the data.

4.3. Value-oriented stakeholder influence strategies

Based on the case-specific analyses and cross-case comparison, we mapped the primary value expectations concerning each influence strategy and cross-tabulated the dominant pairs of influence strategy and value in Table 7. The table illustrates how different stakeholder influence strategies were mainly utilized for stakeholder influence efforts driven by different project value dimensions.

Although the three case projects were different in several ways, the general logic of utilizing different influence strategies (Table 7) was very similar in all three projects. The findings of the three projects varied more on the general activity of the stakeholders and the criticality of the stakeholder influence efforts. Tunnel and Subway appeared as two opposite ends of the spectrum, potentially reflecting the degree of complexity and success of the projects. In Tunnel, the alliance contract simplified the project setting, the project progressed in line with the plan, and the stakeholder influence efforts were mainly focused on the environmental and social aspects of the project work and the project deliverables. In Subway, in turn, the contractual setting was highly complex, the project faced numerous problematic events, and the stakeholders' influence efforts were driven by all three dimensions of project value. The most critical influence efforts in Subway were driven by financial value and systemic value. Despite the numerous critical voices of the stakeholders, their claims were not particularly influential.

Regarding environmental and social value, communication and rules and supervision were the most utilized influence strategies in the case projects. The residents communicated their concerns via media and the authorities set rules for and limitations on the projects. These influence efforts quite often led to implementation as well, especially if they were targeted at the project work instead of the project deliverables.

Regarding financial value, the two most utilized influence strategies were complaints and disputes and decision-making authority. When decision-making authority was used, there were a few instances when a powerful stakeholder made a financial decision and the respective project owner had very little to say. Concerning complaints and disputes, especially in Rail and Subway, several disputes focused on money. These disputes were among the most visible influence events in the projects and resulted in the realization of stakeholder influence.

Finally, with regard to systemic value, the two most utilized influence strategies were communication and decision-making authority. However, this value dimension was significantly less evident in Tunnel, which is understandable considering its single-city context when compared to the two other projects. In Rail, and especially in Subway, there were quite a few influence efforts driven by systemic value, but rather little influence realized on the projects. This could be due to these influence efforts being targeted mostly at the project

deliverables. The projects' key personnel are more reluctant to change the project deliverables than the project work practices.

5. Discussion

The goal of this study was to develop new knowledge on value-oriented stakeholder influences on infrastructure projects. The results have revealed stakeholder influences and value profiles that deviate from previous research and offer unique information concerning transport infrastructure projects. They clearly communicate the special character of stakeholder influence on public infrastructure projects in contrast to the commercial, private construction projects that have been studied previously.

5.1. Types of stakeholder influence strategies

In project stakeholder management literature, the focus has been on the viewpoint of the focal firm or the project (Aaltonen and Kujala, 2010; Mok et al., 2015). In this study, we sought contribution by focusing on the viewpoint of the stakeholders themselves. The few earlier studies following this viewpoint have focused on identifying different influence strategies utilized by the stakeholders (e.g., Aaltonen et al., 2008; Aaltonen and Kujala, 2010). In order to participate in this discussion, the first research question of this study asked: What kinds of influence strategies do stakeholders utilize in infrastructure projects to achieve their goals?

As an overall contribution to the first research question, this study has identified four influence strategies that apply specifically within the context of public transport infrastructure projects pursuing long-term value: communicating, complaining and resolving disputes, setting rules and supervising the project, and using decision-making authority. Of the four influence strategies, the first two are highly evident in the prior literature as well (e.g., Aaltonen et al., 2008; Aaltonen and Kujala, 2010). Our study demonstrates the existence of those influence strategies in the context of public infrastructure projects, thereby complementing previous findings on private-sector construction projects. The “setting rules and supervising the project” and “using decision-making authority” influence strategies have received less emphasis in the prior literature, proposing them as influence strategies specific to public infrastructure projects. In addition, from a stakeholder salience perspective (Aaltonen et al., 2008; Mitchell et al., 1997), it appears that stakeholder claims following the two novel influence strategies are often considered highly legitimate by the project owner in the context of public infrastructure projects.

In this study, we have contributed by demonstrating how different stakeholder groups have access to and primarily utilize different influence strategies. Regarding the few existing studies with explicit focus on stakeholder influence strategies, the focus has been mostly (Aaltonen et al., 2008) or completely (Aaltonen and Kujala, 2010) on only one (mostly opposing) stakeholder group. However, additional research on the diversity of stakeholder influence actions have been called for (Aaltonen and Kujala, 2010). Similarly, in a few recent studies with more general approaches to stakeholder influence, evidence on the diversity of stakeholders' expectations or influence actions have been provided (e.g., Cuppen et al., 2016; Li et al., 2012; Liu et al., 2018). This finding emphasizes the contingency viewpoint to stakeholder management, implying that stakeholders that have access to specific influence strategies due to their network position require also specific response strategies from the project.

The results of this study touch upon the role of secondary stakeholders in infrastructure projects. Earlier, Aaltonen and Kujala (2010) studied a pulp mill construction project and found that the influence possibilities of secondary stakeholders in the project implementation phase were fairly limited. In this study, apart from the environmental and social aspects of the project work, the influence exerted by the secondary stakeholders was fairly limited as well. These findings draw attention to the unequal power distribution in infrastructure project networks, and the need for projects to configure their response strategies for different stakeholder groups.

Finally, a few studies have emphasized the project lifecycle viewpoint to stakeholder influences (e.g., Aaltonen and Kujala, 2010; van den Ende and van Marrewijk, 2018). In our study, the focus was limited to the implementation phase of the infrastructure projects. However, following an event-based process research design (Langley, 1999; Langley et al., 2013), we have highlighted the potentially interconnected and escalating nature of stakeholders' influence efforts over the progress of the project. This idea of escalating influence efforts, possibly combined with the lifecycle viewpoint to stakeholder influences, calls for additional research.

5.2. Project value driving the stakeholder influence strategies

Neither the studies focusing explicitly on influence strategies, nor the literature discussing stakeholder influences on projects more generally (Table 1) have explicitly explained *why* a stakeholder exerts influence on a project in a specific way. Justified by some implicit support in recent literature (Liu et al., 2018; van den Ende and van Marrewijk, 2018), we propose that the concept of project value is a means to justify and adopt certain stakeholder influence strategies. To contribute to this area, the second research question inquired: How do stakeholders' expectations and requirements for project value drive their attempts to influence?

A few recent studies have demonstrated how neglecting the stakeholders' expectations or requirements in large infrastructure or construction projects can generate stakeholder actions against the project (Liu et al., 2018; van den Ende and van Marrewijk, 2018). In this study, we have built on this idea further and provided a more nuanced framework of project value dimensions explaining the utilization of different stakeholder influence strategies (Table 7). As prior literature on stakeholder influence has not provided frameworks like this, a key contribution in this study reveals that stakeholders differentiate their influence strategies based on value dimensions.

Regarding project value dimensions, environmental and social value (e.g., Kivilä et al., 2017; Labuschagne and Brent, 2005) and financial value (e.g., Ahola et al., 2008; Kivilä et al., 2017) have been widely discussed in the literature and analyzed in different project contexts. Our findings offer evidence on how they appeared in transport infrastructure projects specifically. As a novel dimension, the results highlighted the prevalence of "systemic value" that has not been covered in prior studies, especially in the context of public infrastructure projects.

Systemic value deals with the linkages between the project with other projects, other infrastructures and the broader surroundings. Where much of infrastructure project research centers on single project deliveries, this finding portrays the transport projects in tight connection with the broader pursuit of public infrastructure development, potentially as a portfolio of projects or other development ideas or initiatives. In previous research, Martinsuo and Killen (2014) have discussed the learning value between projects in project portfolios and Engwall (2003) has emphasized the need to link projects with their history and context. In our study, we revealed more explicitly the value emerging from the systemic interconnections between multiple projects and between a project and its surroundings, which are highly relevant and typical in large, complex infrastructure projects.

With focus on public transport infrastructure projects, the concept of public value (e.g., Koppenjan et al., 2008) is relevant as well. This study contributes to this discussion in two main ways: by emphasizing the role of different stakeholders and by explicating their competing value claims during the project implementation phase. In the earlier literature, more focus has been on safeguarding performed by the public sector and to lesser extent by the private firms themselves (de Bruijn and Dicke, 2006; Reynaers, 2014). The findings in this study highlight the complex (i.e., vertical and networked) nature of safeguarding performed by multiple stakeholders, including the residents and the general public, for example. Regarding project lifecycle, the majority of the earlier studies have focused on the nature of public values at the project front end (i.e., procurement; e.g., Furneaux et al., 2008; Hueskes et al., 2017) or in the operations phase of a privatized facility or industry (e.g., Steenhuisen and van Eeten, 2008). The results of this study demonstrate how the stakeholders of public transport infrastructure projects do not just follow the implementation of the project, but instead they proactively safeguard public values as the project proceeds. It is expected that the proactive influence during project implementation could be less evident in a different context, such as in private commercial construction projects.

6. Conclusions

6.1. Theoretical contributions

The literature on stakeholder management in projects has tended to focus more on the viewpoints of the focal firm or the project owner than the perspective of the stakeholders (Aaltonen and Kujala, 2010; Mok et al., 2015). This article's contribution has been to reveal the stakeholder influence strategies that are often neglected and identify the values underlying the stakeholder influences.

This study has identified four stakeholder influence strategies: communication, complaints and disputes, decision-making authority, and rules and supervision. Of the four influence strategies, the authority and rule-oriented strategies in particular supplement existing knowledge by emphasizing the importance of the influence exerted by powerful external stakeholders. The prior literature has identified several stakeholder influence strategies (e.g., Aaltonen et al., 2008; Aaltonen and Kujala, 2010; Frooman, 1999) but primarily in connection with private sector construction projects. We revealed significant cross-case similarities in transport infrastructure projects in the stakeholder influence strategies and therefore suggest that project stakeholder influences may be specific to a certain project type.

In this study, we have also argued that the concept of project value provides a way to understand the reasons behind the utilization of stakeholder influence strategies. The results of the study demonstrate how three project value dimensions — environmental and social value, financial value, and systemic value — drive the stakeholders' efforts to influence and how the influence efforts driven by different value dimensions were pursued using different influence strategies. Due to the public nature of infrastructure projects, the viewpoint of public values is relevant as well. Our findings illustrate actions of the public sector and the general public in protecting and safeguarding public values. Further research is needed to explore this contingency view to stakeholder influence.

6.2. Managerial implications

The findings have implications for project management practitioners, particularly those working in the infrastructure delivery sector. The influence events examined in the three projects, the successful alliance setting in Tunnel, and uncertainties (especially in Rail and in Subway) emphasize the importance of clear and unambiguous project contracts. The same applies for additional work. The case projects featured several occasions on which the project owners and their partners were disputing or even fighting in court, partly due to ambiguous contracts or agreements.

In Subway, the representatives of the two cities requested and demanded better and more transparent project information numerous times. These examples highlight a potential challenge when infrastructure projects are not organized as public sector projects, but instead as limited companies, following the requirements of private firms. In all three projects, but especially in Rail and Subway, the projects required additional funding due to either a budgeting failure, surprises in the project work, or additional work. These all highlight the challenging nature of planning and budgeting for large, public sector projects.

Finally, the findings about stakeholder influence strategies provide knowledge for project managers in general. In

particular, the findings demonstrate the different influence strategies utilized by stakeholders and the different project value dimensions driving those influence efforts. Both of these aspects are important when project managers plan their stakeholder management activities.

6.3. Limitations and ideas for future research

There are a few limitations related to the empirical setting which thereby affect the validity of this study. The focus on three transport infrastructure projects strengthens the generalizability of the findings when compared to a single case study design. However, the limitation to a certain project type and context limits the generalizability of the findings to this specific context.

The utilization of publicly available data (i.e., the newspaper articles) has enabled us to discuss the findings openly. It will enable other scholars to evaluate the findings critically and replicate the study. However, the potential bias of the newspaper articles places limitations on the study's validity. For example, not all (minor) influence efforts are discussed by the media and the focus of the media might be biased toward the larger and more powerful stakeholders. We tried to mitigate these validity issues by triangulating the data with official project documentation whenever possible.

Finally, the coding framework utilized can create validity issues. In particular, it is possible that the utilization of existing literature as a basis for the preliminary coding framework has affected the categorization of the results. By building a different preliminary coding framework, or by following a pure inductive coding approach, the categorization might have been different. However, the richness of the data and first doing the coding case by case and then across cases gave the researchers confidence that the best possible framework for this particular data set was used.

Regarding avenues for future research, the findings of this study should be tested in different contexts, including both different types of infrastructure projects and different types of projects in general. Both the stakeholder influence strategies and the relevant dimensions of project value in particular can turn out to be different in different contexts, which we have referred to above as the contingency view to stakeholder influence on infrastructure project networks. The results of the study indicate a difference between project value of the project implementation and the project deliverables. This phenomenon could be studied further in future research. In addition, complementing or replacing the documentary archival data with direct interaction with the stakeholders (i.e., in the form of interviews) could reveal different types of influence efforts and the tacit priorities underlying their influence. The same applies to conducting a study based on real-time observations instead of analyzing historical data.

Conflict of interest

There is no conflict of interest. The editor-in-chief has handled the paper.

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PUBLICATION V

Promoting Project Team Coordination in Repetitive Projects

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Promoting project team coordination in repetitive projects

Abstract

Interdependencies within and between project teams and changes occurring throughout a project's lifecycle create a need for project team coordination. The existing research on project team coordination has mostly focused on large or innovative projects. In addition, the existing research has focused mostly on the ways project team coordination takes place in different projects, with less focus on how beneficial circumstances for coordination are created or promoted. This study contributes to these knowledge gaps by studying how a standardized project management methodology introduced by a parent organization can promote project team coordination in repetitive projects. An embedded single-case study design with qualitative interview-based data collection was followed. The case firm introduced a management framework in its service centers to promote project team coordination in repetitive maintenance projects. The interviewees perceived improvements in communication, visibility of project and portfolio status information, and information sharing. The improvements were enabled by two coordination mechanisms of the management framework: regular meetings and visual whiteboards. The perceived improvements were considered beneficial for project team coordination, both within and between project teams.

Keywords coordination; maintenance projects; repetitive projects

1 Introduction

Teamwork is an established form of work in all organizations, including project teams (Chiocchio & Hobbs, 2014). Teamwork is beneficial for myriad reasons, but mainly because teams tend to outperform individuals acting alone (Baiden & Price, 2011). However, in teamwork, the division of work between team members or between multiple teams creates interdependencies (Hoegl, Weinkauf, & Gemuenden, 2004). This division of work and its consequent interdependencies, combined with possible changes occurring throughout the project, create the need for coordination between various teams and team members (Galbraith, 1973; Hoegl et al., 2004). Here, coordination is defined as "integrating or linking together

different parts of an organization to accomplish a collective set of tasks" (Van de Ven, Delbecq, & Koenig Jr., 1976, p. 322). This article focuses on coordination in projects, especially in and between project teams (i.e., project team coordination).

The earlier literature has discussed project team coordination as one element of teamwork quality (Hoegl & Gemünden, 2001; Hoegl et al., 2004), emphasized the multi-mechanism (Dietrich, Kujala, & Artto, 2013) and dynamic (Dingsøyr, Moe, & Seim, 2018; Dingsøyr, Rolland, Moe, & Seim, 2017; Gkeredakis, 2014) nature of project team coordination, and demonstrated a positive relationship between project team coordination and project performance (Hoegl et al., 2004; Nidumolu, 1995), for example. Regarding context, the existing empirical research on project team coordination is dominated by large-scale and/or innovative projects (Bick, Spohrer, Hoda, Scheerer, & Heinzl, 2018; Dietrich et al., 2013; Dingsøyr et al., 2018, 2017; Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Gkeredakis, 2014; Hoegl et al., 2004). However, not all projects are complex and/or large in scale, and the findings covering project team coordination in highly innovative projects might not apply in less innovative projects (i.e., projects with lower levels of complexity and uncertainty) (Hoegl, Praveen Parboteeah, & Gemuenden, 2003). This article contributes to this knowledge gap by exploring project team coordination in repetitive machinery maintenance projects.

In most of the existing empirical studies on project team coordination, the unit of analysis has been a project, a project team, or a member of a project team. In addition, the research focus has tended to be on the ways coordination takes place in different projects. In this article, the attention shifts to the actions of the parent organization. In particular, this article proposes that a parent organization can take actions to promote or create beneficial circumstances for project team coordination in its project-based activities.

A typical way for parent organizations to affect, guide, and instruct the behavior of project managers and project teams is through the introduction of a project management methodology (PMM). PMMs represent good practices and the knowledge foundations required for managing projects successfully (APM, 2012; Garel, 2013; Lehtonen & Martinsuo, 2006; PMI, 2013). Although some studies argue that a PMM promotes project success (Joslin & Müller, 2015), following a PMM does not guarantee project success (Lehtonen & Martinsuo, 2006), different projects call for different management approaches (Morris, Crawford, Hodgson, Shepherd, & Thomas, 2006), and deviations from the ways of working set out by a PMM can occur for various reasons (Vuorinen & Martinsuo, 2019).

There are various PMMs, ranging from the standards set by and bodies of knowledge of official institutions to tailored company-specific frameworks (Garel, 2013). Despite the nature or the characteristics of different PMMs, all PMMs standardize or structure project-based work in the organization to some extent. This article argues that implementing standardized or structured ways of working (i.e., introducing a pre-defined set of coordination mechanisms) is one potential way for a parent organization to promote project team coordination. The goal of this article is to develop new knowledge on the ability of parent organizations to promote project team coordination in project-based activities by asking the following research question:

> *How can standardized ways of working, introduced by a parent organization, promote project team coordination in repetitive projects?*

This empirical study focuses on repetitive projects—particularly machinery maintenance. In repetitive maintenance projects, different teams or team members are responsible for the different work phases of a project. Thus, several interdependencies exist, creating a greater need for project team coordination. Repetitive projects, such as machinery maintenance, differ in many ways from innovative projects, which possibly leads to project team coordination taking on a different quality in these contexts (Hoegl et al., 2004). The empirical context of this study is described in more detail in the research methods section.

The article is structured as follows. In the next section, the literature on project team integration and standardized ways of working in projects is reviewed. The third section describes the embedded single-case study design, data collection, and data analysis. The fourth section describes the perceived implications of the new ways of working on project team coordination. In the fifth section, the empirical findings are discussed in light of the earlier literature. The main contributions relate to the viewpoint of the parent organization on project team coordination, the conceptualization of coordination as a package of supplemental coordination mechanisms, and the importance of project team communication for project team coordination in repetitive projects. Finally, the study's theoretical contributions and managerial implications are summarized and its limitations and ideas for future research are discussed.

2 Literature review

2.1 Project team coordination

When organizations grow and their tasks become more complex, work is typically divided between teams or organization members. This division of tasks into subtasks and the division

of work between teams or people creates interdependencies and a consequent need for coordination (Galbraith, 1973). To achieve coordination, organizations utilize different coordination mechanisms (e.g., plans or meetings) and coordination modes (e.g., impersonal, personal, and group modes of coordination) (Dietrich et al., 2013; Van de Ven et al., 1976). Coordination can be formal or informal, explicit or implicit, or "bottoms up" (i.e., more pre-planned and formal) or "top down" (i.e., more delegated and informal) (Banks, Pollack, & Seers, 2016). The existing literature has been argued to put only limited focus into informal or implicit coordination (Banks et al., 2016).

There is an extensive field of literature on coordination with strong roots in permanent organizations. Significantly less is known about coordination in temporary organizations (Bechky, 2006; Faraj & Xiao, 2006). However, as in permanent organizations, a similar division of work and tasks takes place in temporary organizations and creates a consequent need for coordination. In project teams, coordination is required both intra-team and inter-team in both intra-organizational and inter-organizational settings. Examples of empirical studies on project team coordination are summarized in Table 1. Following the delimitations of this study, Table 1 includes empirical studies on coordination in intra-organizational projects.

Table 1. Empirical studies on project team coordination in intra-organizational projects.

Study	Context and method	Main findings
Bechky, 2006	- Film projects - An ethnographic study, four projects	- A role-based view of coordination in temporary organizations emphasized. - Characteristics affecting coordination: role duration, expectations of future interaction, and visibility of work.
Bick et al., 2018	- Software development projects - A single-case study	- Lack of dependency awareness as a key explanation of inefficient coordination in agile software development.
Dietrich et al., 2013	- Product development or organizational development projects - A multiple case study	- A portfolio approach to project team coordination emphasized; in other words, coordination being practiced through combinations of coordination mechanisms and modes. - Three coordination patterns identified: centralized, decentralized, and balanced coordination.
Dingsøyr et al., 2017	- Large agile software development projects - A two-case study	- Focus on the group mode of coordination, especially meetings as coordination mechanisms. - Changes in coordination mechanisms over time: from scheduled to unscheduled meetings and vice versa.
Dingsøyr et al., 2018	- Large agile software development projects - A single-case study	- A variety of coordination mechanisms in use. - Coordination is not static, but coordination mechanisms change over time (e.g., a gradual transition to unscheduled meetings).
Espinosa et al., 2007	- Geographically distributed software development projects - A single-case study	- Three types of coordination: technical (e.g., redundant code), temporal (e.g., schedule issues), and procedural (e.g., non-adherence to the established process). - Special coordination problems caused by geographical distribution (e.g., fewer opportunities for interaction). - Shared knowledge of the task and team, task and presence awareness help coordination.

Study	Context and method	Main findings
Gkeredakis, 2014	- Large construction projects - An ethnographic single-case study	- Emphasizes the viewpoint of coordination in practice; coordinating in addition to coordination. - Coordination is a dynamic cycle between focus on getting the local tasks done and focus on ensuring compatibility with external interdependencies and conventions. This cycle requires coordination efforts to be adjusted constantly.
Hoegl et al., 2004	- Product development projects - A longitudinal survey design	- Focus on the performance effects of project team coordination. - A positive relationship between project team coordination and project performance, especially schedule performance. - Project team coordination considered especially important in teams with many technical interfaces with other teams and in the early and middle phases of complex projects.

Table 1 demonstrates how there have already been several studies answering the call for additional research on coordination in temporary organizations (Bechky, 2006; Faraj & Xiao, 2006). The studies have described coordination problems (Bick et al., 2018; Espinosa et al., 2007), emphasized the complementary roles of different coordination mechanisms (Dietrich et al., 2013) and reveled the dynamic nature of project team coordination (Dingsøyr et al., 2018, 2017; Gkeredakis, 2014), for example. Despite these answers to the calls for additional research, two knowledge gaps in the existing empirical research justify the need for additional research in general and this study in particular.

The first justification refers to the empirical contexts of the earlier research. Of the studies exemplified in Table 1, almost all have focused on innovative and/or large-scale projects. These kinds of contexts include software development (Bick et al., 2018; Dingsøyr et al., 2018, 2017; Espinosa et al., 2007), product or organizational development (Dietrich et al., 2013; Hoegl et al., 2004) and large construction projects (Gkeredakis, 2014). However, it is not self-evident whether the same findings apply in environments with lower levels of complexity and uncertainty as well (Hoegl et al., 2003).

The second limitation of the earlier research relates to the unit of analysis. In most of the earlier empirical studies, the analytical focus has been on a project, project teams, or project team members. Consequently, the viewpoint of the parent organization has received significantly less attention. Therefore, this article proposes that the parent organization can take methodical action to enhance and promote project team coordination in its project-based activities. Although none of the earlier studies in Table 1 have taken this viewpoint explicitly, some implicit support for this idea has been offered. For instance, Calamel, Defélix, Picq and Retour (2012) discussed the importance of human resource management for coordination in inter-organizational projects, and Hoegl et al. (2004) discussed ways for managers to promote and

improve intra- and inter-team collaboration. This study focuses explicitly on a set of coordination mechanisms (Dietrich et al., 2013) purposefully introduced by a parent organization.

2.2 Project management methodologies and standardized work in projects

One way that parent organizations affect, guide, and instruct project managers' and project teams' behavior is through the introduction of a PMM. Various PMMs exist, ranging from the standards and bodies of knowledge of official institutions to tailored company-specific frameworks (Garel, 2013). PMMs vary in terms of their comprehensiveness, formality, and systematism, and between standardized versus customized PMMs (Joslin & Müller, 2015; Lehtonen & Martinsuo, 2006), for example. Even if organizations are very active in using such models and methodologies, companies often create or tailor them to meet their own needs (McHugh & Hogan, 2011; White & Fortune, 2002).

Recent empirical evidence has argued that a positive relationship exists between the use of a PMM and higher project performance (Joslin & Müller, 2015, 2016). However, other studies have also emphasized that following a PMM does not guarantee project success (Lehtonen & Martinsuo, 2006), that different projects call for different management approaches (Morris et al., 2006), and that project teams and actors are forced to deviate from the ways of working instructed by PMMs (Klein et al., 2015; Vuorinen and Martinsuo, forthcoming), for example.

Despite the nature or characteristics of different PMMs, at least to some extent all PMMs standardize or structure project-based work in an organization. This article's main argument is that introducing standardized or structured ways of working is one potential way for a parent organization to promote project team coordination in its project-based activities. This idea of a parent organization promoting coordination with purposeful actions has received little attention in the literature on either project team coordination or PMMs.

3 Research methods

3.1 Research design and case context

This study employs an exploratory qualitative research approach and follows a case study strategy. Case study designs are particularly suited to answering "how" questions and exploring the key phenomena in real-life settings (Yin, 2009). In this study, taking an exploratory approach is justified by the limited amount of existing research on this topic, especially with regard to parent organizations' viewpoints on coordination. The research is designed as an

embedded single-case design, meaning that multiple subunits are explored within a single case (Yin, 2009). In this research, the case study focuses on the project business of an engineering company, and the subunits are service centers implementing maintenance projects.

This study used purposeful sampling to choose the case organization (Silverman, 2010) by searching for an organization with an established history in project-based deliveries and an orientation toward service-intensive projects. Service-intensive projects (in this case, maintenance projects) were considered an illustrative example of less innovative repetitive projects (as compared to the innovative and complex projects that are mostly studied in the existing literature). The case organization (hereafter EngineeringCo) selected offers engineering solutions both as standard products and as tailored solutions delivered as customer-specific projects, and it supports these solutions through maintenance, repair, modernization, and spare parts services. The company is a typical example of a manufacturing company that offers its customers both tangible products and intangible services, as both standard and tailored solutions. In that way, EngineeringCo can be considered representative or typical, thereby justifying the single-case design (Yin, 2009).

In this study, the focus is on EngineeringCo's maintenance projects performed in its service centers. The deliveries of EngineeringCo's machinery are critical for its customers' operations and are large in terms of capital. Both due to wear and mechanical stress, and in order to ensure uninterrupted operations in the customers' manufacturing businesses, these machines require maintenance. Maintenance tasks include both regular and scheduled maintenance and unexpected and ad hoc maintenance. Maintenance tasks take place both in the customers' premises and in the service centers. In this article, the focus is on maintenance projects performed in the service centers. In these kinds of maintenance projects, a machine's component or module is shipped from a customer to a service center for maintenance. After finishing the maintenance tasks, the component or module is shipped back to the customer.

EngineeringCo has a long history with selling and maintaining various product models. Consequently, there is some variety in the requirements of the maintenance projects in terms of what has broken or needs maintenance. Service centers also maintain components from EngineeringCo's competitors' machines, which increases this variance. Nonetheless, most of the maintenance projects have similar, distinct project phases. As a result, different employees and employee groups (i.e., project teams) are responsible for each of those project phases. The project phases include customer service, logistics, and different maintenance activities (e.g., operating different machines and tools), for example.

Due to several recognized problems in maintenance project performance and in the old ways of working, a standardized management framework for guiding and structuring project management (i.e., a PMM) was introduced by EngineeringCo. The new framework was developed by a few of the company's experienced key personnel with assistance from an external consultancy company and implemented in several service centers globally. This study focuses on the perceptions of the employees in those service centers.

3.2 Data collection and analysis

Primary data were collected through semi-structured interviews. Twenty-five employees representing five service centers were interviewed, covering different organizational levels, roles, and responsibilities in the service centers, including top management, middle management, production planning, sales, and production workers, for example. Secondary research data, particularly plans and documentation of the management framework, complemented the primary data. Table 2 summarizes the data collection.

Table 2. Summary of the data collection.

Service center	Alpha	Beta	Gamma	Delta	Epsilon
Location and culture	- Far from home country - Culturally different	- Close to home country - Culturally similar	- Far from home country - Culturally different	- Far from home country - Culturally similar	- Far from home country - Culturally similar
No. of interviews	3	7	5	5	5
Average duration of interviews	31 min (20–38 min)	32 min (16–69 min)	27 min (18–40 min)	29 min (21–39 min)	24 min (15–36 min)

The semi-structured interviews focused on the perceived changes when compared to the situation before the new framework, the perceived benefits and challenges of the new ways of working, and the interviewees' ideas for how to improve on the new management framework. The focus of the interview questions was not on any pre-defined case projects but instead on the interviewees' perceptions of the project business of the service centers. The native languages of the interviewees varied, but all the interviews were held in English. The interviews were recorded and transcribed. Illustrative quotations used for this article were slightly edited to enhance their readability, while ensuring that the core message of the quotations was unaltered.

A two-round approach to the data analysis was taken. In the first coding round, a very inductive approach was followed and all the relevant quotations were coded following the "in vivo" coding strategy. A quotation was considered relevant if it discussed a perceived benefit or

challenge of the new way of working, a characteristic of the old way of working, or a perceived difference between the two. In the second coding round, similar codes were renamed and merged and further grouped into categories. The final categories regarding the perceived challenges or benefits included: availability of project information, common direction of a service center, communication between project actors, decision-making, person-dependency and visibility of the project's status.

When analyzing the findings from each of the five service centers (i.e., the subunits of the embedded case study), it turned out that the interviewees' perceptions of the new management framework were very similar. Consequently, a thematic instead of a cross-case analysis was performed. The findings first report some background information on the characteristics and implementation of the new management framework. Then, the perceived changes and implications of the project team coordination are described. The original challenges and the benefits achieved are divided into three subsections: communication and sharing of information, focus and decision-making, and coordination within the service centers.

4 Findings

4.1 Introducing the new management framework

Before the introduction of the new management framework, each of EngineeringCo's service centers took their own approaches to managing maintenance projects. Consequently, the level of efficiency in managing maintenance projects varied significantly across the service centers. Therefore, the new framework was introduced by EngineeringCo to enable a coherent approach toward project management and to make the maintenance project processes more efficient.

EngineeringCo (i.e., the parent organization) developed the new management framework in collaboration with a consultancy firm. During the development work, a development workshop was organized and representatives were selected from the service centers to participate. When the development work had finished, the management framework was introduced in the first service center. Although the main elements of the framework were defined by the parent organization (in collaboration with the consultancy firm), various details had to be tailored to meet the needs of the service center. The service center personnel and representatives of the parent organization and the consultancy firm worked together on this tailoring work for several days. After the introduction of the framework, the employees' experiences, learnings, and feedback were documented to develop the framework and to assist in the future rollouts. In the following months, a similar process took place in other service centers. At the time of the data

collection for this article, the framework had been introduced in five service centers around the globe.

The new framework was built around a very consistent maintenance project process (i.e., project phases), and it consists of three main elements: regular meetings, visual whiteboards, and a structured process for continuous improvement.

Regular meetings follow a standard agenda and take place regularly, almost daily. Importantly, there are meetings taking place at different organizational levels: at the team level, at the production level, and at the service center level. *Visual whiteboards* are designed to track the status of the maintenance projects. All the whiteboards are tailored both between and within the service units, but they all share the same goal of visualizing the status of the projects (with respect to the pre-defined project phases) and selected key performance indicators. As is the case with regular meetings, visual whiteboards are also implemented at different organizational levels. A *structured process for continuous improvement* was designed to ensure efficient problem solving and process development. All the employees can highlight improvement opportunities by marking them on the whiteboard. The improvement ideas are considered immediately (typically the following day) and either handled at the team level or, if necessary, on the production level.

Of the three framework elements, this study focused on the regular meetings and the visual whiteboards as they deal directly with coordination. The following subsections discuss the changes perceived by the interviewees after the introduction of the management framework.

4.2 Improved communication and sharing of project information

Prior to the introduction of the new management framework, communication and collaboration within project teams and between project actors (i.e., within and between project phases) was considered fragmented, irregular, and unstructured. In particular, there was a lot of variance between and within the service centers. Some service centers or project teams held regular meetings and engaged in structured communication, while in others communication was more person-dependent, irregular, and ad hoc.

The introduction of regular meetings into the routines of the maintenance projects was considered beneficial for inter-team and intra-team communication. The interviewees described how it is easier to discuss and communicate when all the relevant people are present, meetings take place regularly, and meetings are efficient and structured. For example:

> *"This is a big improvement. I don't have to ask every day, 'Do we have an answer?' [Before] Every day I had to ask [that]."* (Service center Beta)

> *"Because we have all the representatives from each department so we can get the answer right away. It's very easy to have a common understanding where we are at the moment."* (Service center Gamma)

The visual whiteboards were also considered beneficial for improving communication and efficient decision-making, both within the projects and between them. Before the new management framework, if there had been any problems in the previous work shift, for example, it was up to the employees themselves to communicate the issues to each other. If they forgot, or the relevant people did not meet, significant delays or "hassles" could occur. The visual whiteboards enable the sharing of information outside of the regular meetings. As the interviewees explained:

> *"...it [a visual whiteboard] gives everybody a chance to see it every day and you talk about it every day. You wouldn't talk about if you just put it on a piece of paper."* (Service center Epsilon)

> *"Now it's visual for all the layers in the company, or in the workshop, and in the office."* (Service center Beta)

In addition to the visual nature of the whiteboards, their "equal" or "democratic" nature was considered beneficial as well. In particular, the whiteboards, and to some extent the regular meetings, were considered to promote equal access to project information. As was described in the interviews:

> *"And the operator can see this whiteboard too so they know what has happened."* (Service center Beta)

> *"Everybody, not supervisors or managers only but also the operator, can tell us what is happening and everybody can see. That is good."* (Service center Gamma)

Giving all employee groups access to project information was perceived as an improvement by representatives from all the service centers. Representatives from two of the service centers also explained how a lot of similar information had already been available in various IT systems before the implementation of the new management framework. However, not all employee

groups, such as operators and production workers, had access to those IT systems or even to computers. In this way, the physical nature of the whiteboards was considered beneficial as well.

4.3 Improved focus and efficient decision-making

Improved communication and the sharing of information enabled by the regular meetings and the visual whiteboards were considered to increase the visibility of the status of the maintenance projects and the maintenance project portfolios. Several interviewees described how, before the new management framework, employees tended to limit their focus to their own project phases and to the current work (project) at hand. As a manager of one service center explained:

> *"They [operators or production supervisors] just had one A4 sheet with a printed schedule of each machine. Not the whole overview [of the service center and the projects]."* (Service center Beta)

Empowered by the new management framework, all project actors go through all the ongoing and upcoming projects in the regular meetings (with the main focus being on problematic or critical projects). Similarly, all the projects are visible on the visual whiteboards, with the critical or problematic issues highlighted using color codes. This allows all the employee groups to coherently see the overall status of the service center and the maintenance project portfolios. As two interviewees described:

> *"We go through each project one by one and then find the problems, if there are any."* (Service center Alpha)

> *"We can see rather quickly what's going on in the workshop through the different whiteboards."* (Service center Beta)

Another problem in the past had been inefficient decision-making. Caused by the issues in communication and the limited visibility of the status of the service center and the maintenance project portfolio, significant delays could take place. The regular meetings and the visual whiteboards are perceived as enabling and even "forcing" more efficient decision-making:

> *"We are catching things at the service center that haven't been caught or brought up in the past because there wasn't a mechanism to communicate those things."* (Service center Delta)

> *"On the board there should be a reason why a project is not progressing and we should all be able to respond and react to that as well."* (Service center Epsilon)

A similar idea was expressed in relation to the regular meetings. In particular, several interviewees highlighted the participation of all the relevant people in the regular meetings as beneficial for efficient decision-making.

4.4 Better coordination within the service centers

Emphasized especially by the white-collar respondents, several interviewees highlighted the effects of the new management framework on person-dependency, communication of a common direction, and working as one coherent unit. Without the structured elements of the new management framework, proper communication and the sharing of information was very much up to the individual employees. As one interviewee recalled:

> *"If I forgot to tell him [some other employee], he had no clue what was missing or what he was supposed to be doing to it and where the job was at."* (Service center Beta)

Since the introduction of the new management framework, the regular meetings enable regular communication between all the relevant project actors. In addition, the visual whiteboards ensure that information is shared outside of meetings. The latter benefit was described by one interviewee:

> *"Whiteboard is like a reminder to everybody. You see the whiteboard and are like: 'something has happened, okay I need to follow this one up closely.'"* (Service center Gamma)

Some managerial-level interviewees described how the new management framework enabled the entire service center to work better as one coherent unit, instead of as individual employees or as separate teams working on separate phases of the maintenance process. One managerial-level interviewee summarized the difference as follows:

> *"Everybody is more or less aware of what's going on, what should be done today, what will be delivered tomorrow, what should be completed, those kinds of topics."* (Service center Beta)

This quotation demonstrates how the new management framework is perceived as promoting project team coordination in the service centers. Figure 3 summarizes the key changes perceived by the interviewees, grouped into project team communication, project information, and decision-making, focus, and direction.

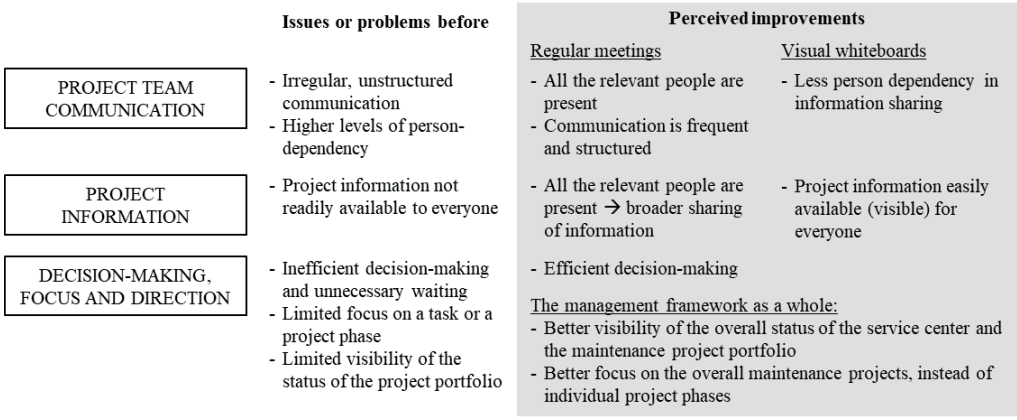

Figure 1. Perceived improvements after the introduction of the management framework.

5 Discussion

The goal of this study was to develop new knowledge on the parent organization's ability to promote project team coordination in its project-based activities in response to the following research question: "How can standardized ways of working, introduced by a parent organization, promote project team coordination in repetitive projects?"

This study answers the calls for more research on coordination in temporary organizations (Bechky, 2006; Faraj & Xiao, 2006). The novelty of this study lies in its focus on a parent organization's perspective on project team coordination. This viewpoint frames the parent organization as an active actor, not just as the context or environment for its project-based activities. The previous literature has discussed the active role of the parent organization from the perspectives of integration (Lehtonen & Martinsuo, 2009), project learning (Bakker, Cambré, Korlaar, & Raab, 2011), and project selection (Lefley, 2013), respectively. However, the existing research has insufficiently covered the aspect of project team coordination. This study has demonstrated how the parent organization can take purposeful actions in promoting team coordination in its project-based activities. After identifying issues in the existing ways of working, the case company (i.e., the parent organization) developed and introduced a new management framework (i.e., introduced new coordination mechanisms). The findings of this study demonstrate how these purposeful actions of the parent organization had positive

implications at the project level. In contrast, most of the earlier studies analyzed coordination mechanisms and modes “as they are” in single projects, or they focused on the role of internal project actors in pursuing coordination.

This study joins the discussion analyzing coordination as a package of coordination mechanisms (Dietrich et al., 2013). Although limited to two coordination mechanisms—regular meetings and visual whiteboards—the findings of this study demonstrate how the coordination mechanisms complement each other in promoting project team coordination. As summarized in Figure 1, the two coordination mechanisms carry different implications for project team coordination. An incomplete understanding of project team coordination would have been reached had the focus been limited to only one coordination mechanism (Dietrich et al., 2013).

By considering the viewpoint of the parent organization, this study contributes to the discussion on PMMs as well. This study has shown how a less comprehensive PMM, in other words a PMM that does not cover all aspects of project management (Joslin & Müller, 2015), can be beneficial when managing repetitive projects. In addition, regarding the benefits of PMMs, this study has proposed a specific connection between the introduction or utilization of a PMM and perceived improvements in project team coordination. In this way, this study complements the findings of earlier studies that have considered PMMs as project success factors or demonstrated a positive relationship between the use of PMMs and project performance (e.g., Joslin & Müller, 2015, 2016).

Finally, this study emphasizes the strong connection between communication and coordination and the special characteristics of repetitive projects. In repetitive projects, such as small-scale maintenance projects, the project phases are relatively well defined and distinctive. Although in many ways beneficial, these distinctive project phases can render the overall status of the individual projects and the overall project portfolios invisible to the project teams and team members. A package of coordination mechanisms promoting communication and the sharing of information can be especially useful in these kinds of contexts. Repetitive projects have received less attention in the project management literature in general and in the literature on project team coordination in particular.

6 Conclusions

6.1 Theoretical contributions

The empirical study has focused on project team coordination in repetitive maintenance projects, thereby differentiating this article from the previous literature that is dominated by complex, innovative, or large-scale projects. This study has revealed the clearly defined and distinct project phases and the importance of project team communication and visibility to project status information as special characteristics for project team coordination in that context.

While the earlier literature predominantly studied project team coordination "as it is," this study has demonstrated how the parent organization can take active steps (i.e., design and introduce coordination mechanisms) in promoting project team coordination in its project-based activities.

Finally, this study has conceptualized project team coordination as a package of coordination mechanisms. This study has demonstrated how different coordination mechanisms supplement each other, in other words, how they have different implications for project team coordination. By studying coordination mechanisms with a strong focus on communication, this study has demonstrated how better communication can take place in the group and in impersonal coordination modes as well, in addition to the more obvious personal coordination mode. In the context of repetitive projects, together these coordination modes may activate learning and knowledge diffusion between projects and therefore contribute to capability development over the long term.

6.2 Managerial implications

The findings of this study have several implications for project management practitioners. The viewpoint of the parent organization and the concept of coordination as a package of coordination mechanisms emphasize how the parent organization can promote coordination in its project-based activities by designing a package of coordination mechanisms (e.g., a management framework). When designing the package of coordination mechanisms, the complementary roles of the coordination mechanisms should be taken into account.

Another important aspect highlighted by the findings of this study is the crucial role of communication and the sharing of information in project team coordination. Parent organizations should seek out ways of enabling and ensuring intra-team and inter-team communication and facilitate easy access to project and portfolio status information. As

illustrated in this study, different and complementary coordination mechanisms and coordination modes can be utilized for these purposes.

A unique feature of repetitive maintenance projects is the relatively clear division into distinctive project phases and the simultaneity of multiple projects. Coordination in and between project teams can be used as a means of doing the right thing at the right time and thereby successfully manage the portfolios of different activities. In these kinds of contexts, it is especially important for the parent organization to help employees expand their line of vision from the current work at hand to the whole project and other simultaneous projects.

6.3 Limitations and future research

The main limitations of this study relate to its empirical and methodological setting. The empirical focus was limited to the project-based activities of one engineering company. The possible bias caused by this limitation was mitigated by studying coordination in five service centers (i.e., an embedded single-case study design). Still, the findings of this study should be tested in a wider range of different organizations. Similarly, the generalizability of the findings beyond the context of repetitive maintenance projects requires further investigation.

Methodologically, the findings are mostly based on the interviewees' retrospective perceptions. The possible bias caused by this limitation was mitigated by interviewing a number of interviewees with varying roles and backgrounds and across the different service centers, with their somewhat different cultures and histories in terms of managing the maintenance projects. The timing of the interviews was planned so that the interviewees already had some experience of the new ways of working after the introduction of the management framework but could still recall their experiences prior to the implementation of the new management framework.

This study proposes several avenues for future research. The findings should be tested in different contexts, including in different parent organizations and different projects. In addition, since this study was among the first to emphasize the parent organization's viewpoint and its purposeful actions in promoting project team coordination, its findings remain relatively exploratory and call for additional research to be undertaken with more nuanced approaches and explanatory research goals.

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